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THE BULLETIN OF THE AMATEUR ENTOMOLOGISTS' SOCIETY

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The Amateur Entomologists' Society
355 Hounslow Road, Hanworth, Feltham, Middlesex

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NOTICE TO CONTRIBUTORS

The Editor is pleased to consider all notes and articles submitted He particularly appreciates those that are typed but emphasises that this is not essential (unlike nearly all other Journals!). He would like to draw the attention of all contributors to a few simple rules, the following of which will greatly facilitate his editorial duties. These rules apply to both typed and hand-written articles.

They are:

1. Use as large a piece of paper as possible. Decimal A4 or old-fashioned Quarto or Foolscap are the most convenient.
2. Use only one side of the paper.
3. Leave wide (not less than 1 inch please) margins to both left and right of the writing.
4. The style of the Bulletin is to include the scientific name of an insect and the author who named it. Include these wherever possible, but if not known leave enough space for your Editor to fill in.
5. Always use double (or even treble) spacing when typing, and wide gaps between lines when writing by hand. This not only leaves ample space for editorial changes, when required, but also greatly facilitates the typesettting when the manuscript finally reaches our printer and so helps to both avoid mistakes and speed production which in turn helps to hold down ever increased printing costs.

Thank you one and all.

Brian O. C. Gardiner.

AES
BULLETIN
No. 310

EDITORIAL

In spite of a very rainy morning, our Annual Exhibition last year again proved to be very popular and the turnout was as numerous as ever. The quality and presentation of exhibits was high and the various demonstrations were exceedingly well attended. Not only individuals, but also other Natural History Societies are being attracted to and exhibiting at our Exhibition and that members come from far and wide is evidenced by representatives from Malta and Cyprus being present. The smooth running of the Exhibition tends to be taken for granted and members do not perhaps realise the immense amount of work put in, not just by Council members, but also by their relatives and friends. Your Editor, who played a very minor role in the affair, would like to publicly record the corporate thanks of all those who enjoyed the exhibition to those, too numerous to name individually, who made it the success it was.

With this issue we part with thirty years of tradition and hope all members like our "New Look" cover.

PURE, UNASHAMED, DELIGHT

Long live the AES Exhibition, our annual spectacular extravaganza of colourful wild life (the insects are nice, too)—our two-legged multitude seething enthusiastically among a six-legged profusion—our own personal Petticoat Lane of busy bubbling trade—truly the envy of every overseas entomologist I've ever written to.

Where else can fingers be "eaten if offered" next to heaps of unheard-of literature being sold from anything between 1p and £100? Where else can one wield forceps from one bargain store to the next, and deliberately request products in learned Latin? Where else can one be proud to exhibit an Old Lady and a Chinese Character pinned in the same box?

I wonder how many of us have tried to visualise Holland Park School a mere 40 hours or so after our closing time? Assembly at 9 a.m. on Monday morning, the fine resonant hall echoing vigorously to the concerted (or otherwise!) voices of super-abundant London youth in full song. Let us, in our turn, sing our own kind of praise to the incredibly hard-working organisers, catering staff, furniture shifters, dealers, conservationists, and all AES members who regularly combine to pack our annual festival with such genuine vitality and value.

Nor would I miss one for all the bugs in the world!

Brian Wurzell (3718)

"THE ENTOMOLOGIST"

When our days were filled with butterflies,
And our nights were filled with moths,
And our dreams were dreams of caterpillars,
And creepy-crawley thoughts,
And the buzzing wings of dragonflies,
Broke the silent summer days,
What a lovely world it seemed to us,
In O' so many ways!

When we reared our first *japonica*,
With its great high thin black horns,
And Dad wondered where his privet went,
Getting shorter with every dawn,
Or that sting from our first *Automeris*,
And the rash that it left on our wrist,
What a lovely world it seemed to us,
With such species to add to our list!

When perhaps we obtained some *regalis*,
To many the prize of them all,
And we watched as they grew . . . and grew bigger still,
And we thought, 'they're not larvae at all',
Or that day when our very first *atlas* appeared,
With its great wings spread out on each side,
What a lovely world it seemed to us,
And we gazed at them, all, like a child!

Wesley Caswell

AES INSECT BEHAVIOUR & ANTS STUDY GROUP

The AES Insect Behaviour Study Group was formed in May 1973 from five members who wrote to me in answer to an advert in the AES Wants and Exchanges List. The first Newsletter was published in the same month containing ideas of what the Group could do regarding individual projects and initial investigations. With so few members to start off with it was difficult to get things moving in the Group. The next two Newsletters presented more practical suggestions for work using the guidelines of members' comments. Much of the credit for the initial setting up of the Group should go to Mike Samways who offered much advice and encouragement during this difficult stage. Unfortunately, he withdrew from the Group in April 1974 due to his time consuming work on a thesis.

The fourth Newsletter, published a year after the Group's inception, saw a vast improvement in its format and general appearance. The Newsletter

was reproduced by photocopying permitting the use of letraset headings and drawings of insects submitted by members as part of their letters of comment and articles. This issue also reported some progress with the spring months' experiments outlined in detail in a Supplement to Newsletter No. 3, and notification of the Group's official existence to the AES Honorary Secretary. Terms of membership were also outlined putting the Newsletter onto a regular quarterly basis and introducing a subscription to cover the cost of producing it.

A field meeting was arranged by ballot and held on 17 August 1974 at Oxhey Woods, Hertfordshire. There were three attending members (the total membership was nine). Tape recordings were made of the flight sounds of the hoverfly, *Syrphus ribesii* L. (Diptera, Syrphidae) including a buzz emitted from the vibrating wings when the flies settled on the microphone. It was later noted that the same thing occurred when they landed on vegetation. A few other observations were made; a report of the meeting appeared in Newsletter no. 5.

In October 1974, the AES British Ants Study Group, run by Brian Williamson, merged with the IBSG resulting in the present name and group structure. A Group Committee was set up consisting of Ken Mardle (Honorary Secretary), Brian Williamson (Associate Editor), and Mike Parsons (Treasurer/Membership Secretary) to administer the affairs of the Group. The membership doubled to fifteen members. A distribution map of members and membership list were published in Newsletter no. 6 in November 1974. This issue saw the beginning of the continuing trend of including major articles by members. The Group possesses a wide span of age groups and useful articles have been contributed by members of several age groups including junior members.

A Group account was opened in January 1975 with the help of the AES Grant and members' subscriptions. Members were advised that all cheques and postal orders should be made payable to "AES Insect Behaviour & Ants Study Group" and crossed. The account is managed by Mike Parsons.

An Insect Ecology Section was set up within the Group and consisted of six members. Three Section Circulars have been published and Section News appears occasionally in the Group Newsletter. The work of the Section is coordinated by P. Anthony Arak who proposed that each member should continue to investigate his own line of study with helpful ideas, criticisms and aid being contributed by other members.

A summary of members' work and distribution map of the Group's twenty-two members appeared in Newsletter no. 9. Efforts are being made to coordinate a group project and there is plenty of scope for useful work to be done. The Group always welcomes new members; details are available from Mike Parsons, whose address appears on the inside cover of the Bulletin.

Ken Mardle (4668)

A CODE FOR DEALERS

At its November meeting, the Council of the AES considered details of "A Code of Conservation Responsibility" agreed by a group of firms dealing in live and dead insects. The Council welcomed this initiative and it was agreed that the code and the names of those persons or firms subscribing to it should be published in the Society's Bulletin. The details are set out below.

CONSERVATION RESPONSIBILITY

In November 1974 a Meeting of the main Entomological Suppliers was convened in London to agree a code of Conservation Responsibility. The following points form the initial code: —

1.) *A "Red List"* of endangered species from overseas will be kept and any species on the list will not be bought by the Parties to the code (who are named below) or offered for sale. The list will be as brief as possible, and only species relevant to those which are likely to be imported will be included. The Parties to the code of Conservation Responsibility will regularly review the question of species for the Red List. The species will be confined to those whose need is critical, and in full agreement of those concerned. Moths will of course, be included as necessary. The question has arisen over *Parnassius apollo* which is declining in some areas, yet is abundant in others. In this case the species may be restricted from defined areas.

The first three species are:—

Troides aeacus kaguya
Delias hyparete peirene
Delias aglaia

All from the island of Taiwan.

2.) *Specimens of Protected or Endangered British Species* will not be collected for sale at all. Parties to the code wish to stress that sale of such specimens from old collections will continue, and it is by this means that collectors can continue to obtain rarities.

Species that will not be collected for sale as collectors' specimens:—

Large blue (*Maculinea arion*)
Chequered skipper (*Carterocephalus palaemon*)
Large tortoiseshell (*Nymphalis polychloros*)
Black hairstreak (*Strymonidia pruni*)
Brown hairstreak (*Thecla betulae*)
Heath fritillary (*Mellicta athalia*)

3.) *Offered series of wild-caught British Specimens* will be refused if they have been caught for the purpose of selling as a stock to suppliers. Genuine duplicated and "thinnings" from a collection are considered as being quite distinct, but the Suppliers wish to make it clear that they will not go out themselves (or let any other person) and collect stocks of scarce or endangered butterflies or in any

other way endanger our native fauna. Similarly livestock of endangered species will not be collected.

The formation of an Entomological Suppliers Association was proposed which will be co-operating in all such matters relating to Conservation Responsibility. At the meeting was a representative of the Ministry of Agriculture with whom there is also co-operation relating to importation of potential pest species.

Parties to the Code

R. Baxter
The Butterfly Farm
L. Christie
D. B. Janson
Imago Butterflies
Nature Of The World
Watkins & Doncaster
Worldwide Butterflies Ltd.

AES ANNUAL EXHIBITION 1975

The Exhibition was held on Saturday, 27th September at the Holland Park School, Campden Hill, London, W.8. It was inevitable that we would suffer a bad day weatherwise, sooner or later, after enjoying good conditions for so many years. The slight consolation was that the torrential rain eased in time for our return home. As expected, members and friends arrived in numbers at least equal to past years, a testimonial to their enthusiasm.

1975 was our 40th Birthday and a special feature was prepared by two present and one past members of the Council together with our Publications Agent, being Messrs. Cooke, Keen, Lewis (E.) and Christie. This covered records of all Office holders of the Society for the past 40 years, copies of early Bulletins (some very rare) and an almost complete set of our numerous publications, over the years.

It is pleasing to report that the numbers and interest of exhibits provided by members, maintained the improvement of latter years. Notably, Juniors presented some very good work. After a long inspection by our President and Editor, 3 prizes were awarded. First to P. Williams for his survey of Social wasps and Bumble Bees, second to N. Armes of the St. Ivo Natural History Society for his work on Dung beetles and third to A. D. Creber for his research on the Heath fritillary butterfly. Further details appear in the text.

A special feature this year, was the emphasis on practical work. Setting techniques were demonstrated by Messrs. P. W. Cribb (Lepidoptera), E. S. Bradford and A. M. Emmet (Micro-lepidoptera), G. R. Else (Hymenoptera) and R. W. J. Uffen (Photography). A. Morris showed a cine-film on collecting in Southern France and R. W. J. Uffen talked on Insect photography.

The AES Council warmly thanks the many members and friends who contributed so much to the success of the Exhibition. First to our Organiser, Bernard Skinner and to Joan Hilliard and the willing team of ladies who turn out annually to provide a first class catering service at very modest prices. E. S. Bradford was responsible for all the signs and posters, Stephen Cribb acted patiently as doorkeeper, Peter Taylor and his team manned the table selling members surplus material for AES funds and L. Christie displayed efficiently our range of publications.

Only about one third of the members exhibiting provided written details for record purposes. The Society aims at compiling a complete list but regrettably, one or two may have been omitted in the following review.

AES CONSERVATION GROUP. The theme was 'What you can do'. An illustrated series of suggestions for action by the individual, habitat conservation, working with local bodies, recording, breeding, releasing and publicity. Exhibits were by Group members, Messrs. Bradford, Cribb, Uffen and Lonsdale.

AES EXOTIC INSECTS GROUP. Details of work being carried out. Life history of moth *P. rosea* and a selection of exotic silkmoths. These included *T. polyphemus*, the Eyed silkmoth, sometimes a pest of Maples in N. America. The larva shown was feeding on Beech.

AES INSECT BEHAVIOUR & ANTS STUDY GROUP. A review of the Group's activities. R. W. Mardle (4668) showed copies of the Group's Newsletters and other publications including circulars and supplements.

BENHAM B. R. (4393) & MUGGLETON J. (3253). Ladybird distribution maps. Provisional marked maps of the British Isles and description of the scheme. Specimens of 26 species and their varieties.

BETTS C. R. (4976 J). A wasp nest in captivity. Accurate drawings of complete life history and notes on operational difficulties. Bumble bees of the World. Descriptions of species in the sub-genus *Alpigenobombus* Skorikov. Charts showing the relationship between material from different Continents.

BOLTON T. (5306J). An interesting and extensive selection of exotic butterflies, moths and dragonflies.

COSTER W. L. (4697). Some autumn feeding *Eupithecia* (Pug) larvae. 7 species were shown, obtained from the flowers and seed-heads of Nettle leaved bellflower, Burnet saxifrage and Angelica.

CHANDLER P. J. A selection of Hoverflies and uncommon diptera. Local Aculeate hymenoptera, (Bees, wasps, ants).

CREBER A. D. (4893 J). Detailed maps showing distribution of Heath fritillary butterfly (*M. athalia* Fab.) in the West Country. Sketches of wing pattern and the 4 usual foodplants and type specimens. Also varieties of the Chalkhill blue butterfly (*L. coridon* Poda).

Plate A. General view of our Exhibition (photo by J. S. Chambers).

CRIBB P. W. (2270). Butterflies taken June, 1975 in Slovenia and Croatia (Jugoslavia). These included two species peculiar to the area, the Wood white, *Leptidea morsei* Fent., and *Neptis sappho* Pall. An unusual female aberration of the Adonis blue. *Lysandra bellargus* Rott., taken near Jesenice was half ab. *ceronus* and half typical. Butterflies collected in North France in August from the Department of Aube included a short series of *Lycaeides agyrognomon* Berg. (Reverdin's blue). Also British butterflies bred in captivity from stock used for release purposes including the Marsh fritillary, *E. aurinia* Scud., the Glanville fritillary, *M. cinxia* Fab. and the Heath fritillary, *M. athalia* Fab.

CROW P. N. (393). Welsh records and specimens of insects from Merioneth. These included *C. tullia* M. (Large heath butterfly) not previously observed in the County, *A. selene* S. (Small pearl-bordered fritillary), 2nd brood and the local moth, *A. ashworthii* Doub. (Ashworth's rustic) and a parasite: the Horse-fly, *Tabanus sudeticus* Z., (known locally as 'Hurricane Robin'), the Hover fly *Erizona syrphoides* F., only the second Welsh record and the robber fly, *Asilus crabroniformis* L., one of our largest flies.

DAVIES A. L. Dr. (4784). An improved short method of preserving larvae by dessication (heat). Specimens treated, retained their natural form though green larvae, faded. Fuller notes appear in AES Bulletin, Vol. 33, No. 302.

ELSE G. R. (3881). Local Aculeate Hymenoptera (Ants, bees, wasps) collected in Hampshire, E. Kent and Suffolk this year, with notes and data. These included *E. borealis* Zet., added to the British list in 1972, the rare woodland bee *H. cornutus* Curtis and a gynandromorph of the bumblebee *P. vestalis* Geoffroy, the first known British example. This is one of the 'cuckoo bees' which lays its eggs in the nests of other species and mimics its hosts.

EMMETT A. M., M.B.E. (1379). New, rare or previously unrecognised species of British micro-lepidoptera with related species for comparison. Immaculately set specimens with full data.

FERRY R. S. (111). Interesting Longhorn beetles from Hertfordshire. These are wood feeding insects usually with very long antennae. Included was *A. moschata* L., the Musk beetle, a large metallic green insect which feeds on decaying willows, mainly in N. England and Scotland.

GARDINER C. J. (5249). An interesting sample of insects from Switzerland covering grasshoppers (Orthoptera), Bees (Hymenoptera), Beetles (Coleoptera), Mayflies (Ephemoptera) and Stoneflies (Plecoptera).

GARDINER D. J. (4304). Diagrams of the food chain for a typical pond, showing the planktonic algae, planktonic animals and carnivorous animals in relation to the continuous building up and breaking down processes.

HEATH G. L. (4409). Photographs and specimens of praying mantises. These are allied to the cockroaches and are mainly tropical insects. Of the

2000 species known, only 12 occur in Europe and the best known of these, *M. religiosa,* is the original 'praying mantis'. All are carnivorous, seizing their prey with their powerful front legs.

HILLIARD R. D. (99). Common autumn larvae obtainable easily by beating Birch. These included Green silver-lines (*B. prasinana*), Pebble hook-tip (*D. falcataria*) and Peppered moth (*B. betularia*) which complete their growth this year and Willow beauty (*C. rhomboidaria*), Large emerald (*H. papilionaria*) and Scalloped oak (*C. elinguaria*), hibernating on the branches over winter and feeding up in the spring.

A selection of butterflies and moths collected in Assam 1943/5 by J. E. Knight and the late F. R. Sutton. Presented to the Society to be sold for funds.

HOPPER R. J. (4848). Livestock of various orders including the boldly striped Stick insect *A. buprestoides* Stoll. This species comes from Southern U.S.A. and can be reared on bramble, rose and turkey oak.

JAMES R. J. (5005 J). Spring and summer broods of the moth *C. saltitans,* bred from Mexican jumping beans. Life history of Oak eggar moth (*L. quercus* L.). Four generations of the Large white butterfly (*P. brassicae* L.) showing the incidence of the aberration '*coerulea*' through the recessive 'blue gene'. The normal cream colouring of the underside is replaced by a blue irridescence.

JEWESS P. J. A collection of Kentish lepidoptera bred or caught, 1973/5. Species comprised ones with mainly South Eastern distribution and a few found rarely in the South East.

KEEN D. H. R. (3309). Dragonflies of Esher Common, Surrey. A specimen of the 25 species recorded from the Common since 1899. Lucas (British Dragonflies 1899) mentions 18 species and Longfield (Dragonflies of the London Area 1948), specifies 13. Up to date records show 19 species between 1959/66 and 14 in 2 visits, this summer. Notes on each species and photographs of the Common.

McCORMICK R. F. (3375) & PENNEY C. C. (3880). A collection of Butterflies to show the different species found on two soil types in Surrey, Mitcham Common (Sand/clay acid) and Banstead Down (basically Chalk). The Blues (Lycaenidae) were mainly on chalk with the exception of the Common blue, *P. icarus* Lat. and Holly blue *L. argiolus* Fel. which were common to both areas. With the other families, availability of food-plants was probably the determining factor, such as the absence of the Purple hairstreak, *T. quercus* Fab. from Banstead where there is a lack of scrub oak.

MCLEAN I. (3848). Empiridae (Diptera), collected on a camping holiday in N.W. Scotland, June, 1975. These are medium sized bristly flies and the larvae live in decaying vegetation or water. The adults are sometimes called 'Dance-flies' from their habit of congregating in swarms like gnats. Also an example of the uncommon beetle, *T. fasciatus.*

MARTIN P. A. (5228). An exhibit by the Croydon Natural History and

Scientific Society. An illuminated display of colour slides of lepidoptera including larvae, specimens and water colour paintings of moths occurring in the London Urban area by the Exhibitor and T. Short and copies of their publication, 'A Survey of the macro-lepidoptera of Croydon and N.E. Surrey'.

PARKER R. European butterflies with the accent on the Satyridae. There are some 113 species of the latter occurring in Europe of which 11 are on the British list. Often called the 'Browns', they range from some of our commonest butterflies to the specialist *Erebias* of the high mountains.

PARKER R. F/LT. (5247). Butterflies taken in Cyprus in 1974/75. The wealth of species contrasts sharply with the very limited fauna of the Balearic Islands in the Western Mediterranean.

PICKLES C. T. Mrs. (5225). An interesting selection of Blue butterflies (Lycaenidae) including varieties, taken in the first 5 years of collecting, 1971/5.

PORTER K. (4505). Lepidoptera collected in Northern England and Scotland, showing the marked climatic difference between the North and South of the British Isles.

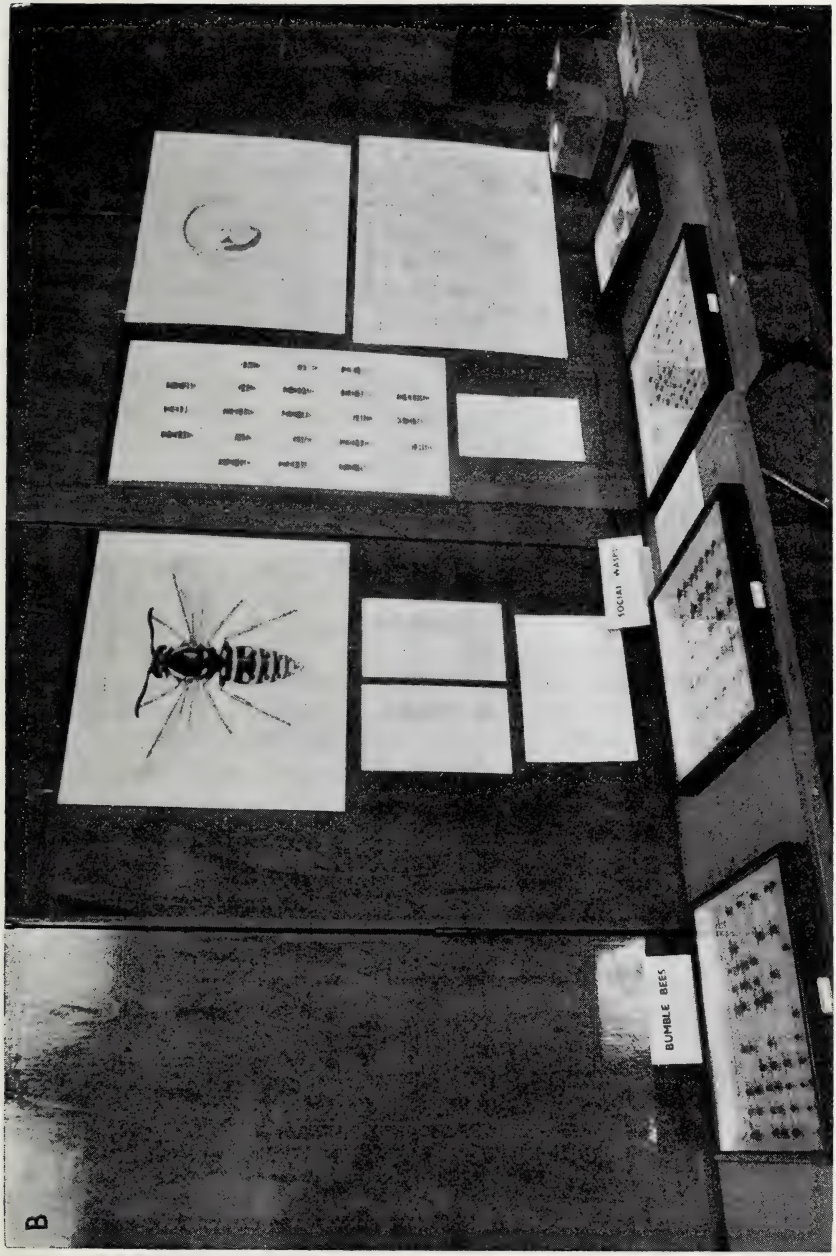
REVELS R. (3942). Special features of activities in 1975. A cabinet of butterfly aberrations taken in the field, a cabinet of varieties bred, a series of bred Lime hawk moths (*M. tiliae* L.) and a brood of larvae of the Large heath butterfly (*C. tullia* Hubn.) Also large photographs of the butterflies.

ROCHE J. (3096). Preservation of lepidopterous larvae by means of injection, pioneered by Dr. P. Houyez of Liege. The method consisted of evisceration of the larva after refrigeration, injection of a mixture of paraffin wax, beeswax and gum arabic, and after re-blowing, fixing in a solution of sodium chloride, distilled water, alcohol and formalin. Caterpillars treated this way, are the nearest to the living, in appearance.

ROTHAMSTED INSECT SURVEY. Aspects of the work of the Biological Records Centre and National Data Bank. Computer maps showing annual change in distribution. An index based on species frequency distribution and independent of size, is used as a measure of diversity. Photographs of light and suction traps, in action.

SKINNER B. F. (2470). A detailed survey of field work in 1975. British geographical races of Meadow brown (*M. jurtina* Sch.) and Grayling (*E. semele* Hubn.) butterflies. Migrant lepidoptera in 1975, Striped hawk (*C. livornica* Esp.), Cosmopolitan (*L. loreyi* Dup.), Ni moth (*P. ni* Hubn.) and Purple marbled (*E. ostrina* Hubn.). Local species taken in Ireland in June and July and lepidoptera collected and bred from the Shetland Isles in 1974/5.

Plate B. The prize-winning exhibit of Junior member Mr. P. Williams (photo by J. S. Chambers).


B
BUMBLE BEES
SOCIAL WASPS

ST. IVO NATURAL HISTORY SOCIETY. The display of many Orders which the pupils of this School are breeding, is always a major attraction at the Exhibition. Taking two items at random; the young lady enmeshed in a 213 cm Boa constrictor and the specimens and drawings of the different species of turtle. However the outstanding item was the work of Nigel Armes. This was a comprehensive exhibit of Dung beetles (*Scarabaeidae*), comprising live specimens, large drawings and life histories.

SOKOLOFF P. A. (4456). Five species of Burying beetles (*Silphidae*) taken at M.V. light, Great silver beetle (*H. piceus*), our largest water beetle up to 50mm in length and 2 diving beetles, *D. marginalis* and *D. circumflexus*, the larvae and adults of which are fierce carnivores. Micro-lepidoptera including leaf mines, imagines and parasites of *P. nigrescentella*. Also photographs taken by a scanning electron microscope.

TREMBATH D. A. (3486). A good collection of exotic butterflies. These have been a feature of the Exhibition over recent years and members are now breeding some of these species. Also notes and life histories are an added attraction.

TURNER N. E. Lepidoptera from Brazil. The brilliant and distinctive species of *Agrias, Catagramma, Caligo, Heliconius, Ithomia* and *Morpho* are peculiar to Central and South America.

TYLER D. B. (3865). Examples of the Grayling butterfly (*E. semele* Hubn). and ab. *holonops*.

UFFEN R. W. J. (1660). Large examples of Ectacolor prints made from transparencies and Cibachrome Colour prints. The latter are fade-resistant whereas the former only enjoy a limited life.

WHITEBREAD S. E. (4818). Micro-lepidoptera collected this year and their host plants. The latter included Golden rod (*S. virgaurea*), *Chenopodium* spp. (Goosefoot) and *Atriplex* (Orache). Bred *Depressarias, Agonapherix* spp. and most of the genus *Fencosma*. Record of 3 species representing new County records.

WILLIAMS P. (4965 J). Social wasps and Bumble bees. A provisional list of the described species of the genera *Dolichovespula* and *Vespula* of the world. Drawing of entire *V. austriaca* Panzer and colour patterns of exclusively Asian species of the above genera. Comparison of the structural characteristics and nesting habits of the species. A representative collection of social wasps of the world. Charts and specimens illustrating pre-social development of nests of the above genera. Live colony of *V. vulgaris* L. (Common wasp). Collection of 23 species of bumble bees from Britain, Europe and California.

ZOOLOGICAL GARDENS (LONDON). A selection of insects and other orders from the Insect House at the Zoo. Included were Bird eating, Baboon and Barrel spiders, Whip scorpions, Blue land crabs and Giant spiny stick insects.

R. D. Hilliard (99)

A DEFENCE OF INSECT COLLECTING

This article was prompted by another which appeared in the Bulletin in May, 1975 entitled 'The Iris Onslaught' which included a few interesting notes on *Apatura iris* L. but which annoyed me by appearing to be largely a rude, unthoughtful and unnecessary criticism of butterfly collectors in general. I, for one, object to being classified by one unqualified to do so as a 'kite-netted maniac', or even a 'persistent pain in the neck collector'. By avoiding such terms as 'Sunday afternoon conservationists' and 'self righteous camera fiend', I hope to avoid simple revenge in the following article and to produce instead a reasoned argument in favour of collecting insects that will, I hope, form a genuine contribution to the unending argument over the future of the British insect fauna.

It may appear to many to be a suicidal step to attempt to defend the killing of native insects in the present 'conservationist' climate. However, let me point out from the start that I am not defending the type of collecting that was prominent during the last century, exemplified by Mr. Ramsay's game of taking as many specimens as possible of *Aporia crataegi* in one sweep of the net (in Newman, 1874)! However, there are still many people, myself included, who derive much pleasure from collecting insects above and beyond the feeling of scientific achievement when, for example, a rare animal is found in some previously unrecorded locality. In such a case specimens must be taken to ensure correct identification especially in, say, such groups as the Coleoptera which include many taxa that can only be identified by microscopic examination of the genitalia. It must be remembered that the specimen is the ultimate record of the presence of an insect in a particular locality and no mileage of expensive colour film, however faithful in colour reproduction, is ever going to change that!

It must also be remembered that we owe our extensive knowledge of the distribution and taxonomy of our native insect fauna to the collector who spends much of his time in the field. Are such eminent gentlemen as Drs. Ford and Higgins, Mr. Riley and Brigadier Lewis to whom we owe so much knowledge of butterflies really only 'persistent pain in the neck' collectors? Obviously not, but then neither are the numerous amateurs whose records and observations, steadily accumulated, allow those of us engaged professionally in entomology to continue with our work. The achievements of the amateur should never be belittled, nor his methods unconstructively criticised.

Despite the massive contribution of the amateur to entomological science, he is still cruelly criticised for wanting a Purple emperor for his cabinet. I would say that this was a small sum to pay for services rendered.

There are, of course, certain species of British Lepidoptera in particular that should not be collected at the present time. The species

involved are too famous to be listed here and their plight is well known. I am sure that even the most callous of collectors would not contribute to another *Lycaena dispar dispar* calamity. Whatever else they may be, insect collectors are people that recognize and appreciate beauty, and would not contribute to the loss of a unique aspect of it.

The author of the article mentioned above was only one in a growing number of entomologists who advocate the use of the camera in recording insects. He pointed out that Frohawk would have used similar methods to his own had the technology been available to him. This I very much doubt as works such as that of Frohawk depend upon painstaking study of specimens to examine details of structure that would not be available in a photograph. I feel that photographs have only a limited usefulness in entomology, and in entomological text books should only occupy a poor second place behind ink drawings and paintings made from actual specimens. I would be greatly suspicious of any latter day, self-styled Frohawks and Souths who depended upon photographs made in the field as opposed to specimens in the laboratory as a basis for their work.

In conclusion I hope that I have started a discussion that will continue in the Bulletin for some time. I hope for more rational criticism of insect collecting in future. The time has come for those of us who enjoy collecting insects to stop feeling as though we are some kind of moron who derives pleasure from every twitch of the specimen in the killing bottle merely because some other, less serious, entomologist says so. The author of the '*Iris*' article, in a fit of bad poetic eloquence, asks what sort of a person could kill a Purple Emperor. I reply simply, and without guilt, "a person like me, sir, a person like me! "

M. D. Bryan, BSc. FRES

COLLECTING NOTES—COLEOPTERA

Orobites cyaneus L. is a small blue-black weevil widely distributed in the British Isles. It is associated with various species of violet, and can be found through diligent searching under hedgerows or in woods where the foodplant is known to grow throughout the year. In my own experience it is best to search for *cyaneus* in late winter or early spring when the beetle is hibernating. Moss growing near the foodplant should be pulled up and sifted over the collecting sheet; the roots of the violet plants will also repay examination. This is a very sluggish weevil and will remain still for a considerable time, even during warm weather, with legs and rostrum drawn in tight against its body, bearing strong superficial resemblance to a seed, and is thus easily overlooked. It is never really abundant and generally occurs singly or in twos or threes. Quite often it is to be found in moss so dry that it harbours no other insects.

J. Cooter

HYMENOPTERA ACULEATA IN SUSSEX

During the last three years I have been developing an interest in aculeates, particularly in Sussex. In view of the richness of the area so far investigated it was clear that it would be worth mapping the distribution of the Aculeata in Sussex. I commenced this mapping scheme in the Spring of 1974. I anticipate that provisional maps, for West Sussex at least, will be available in three to four years' time.

I am using the national 10 Km Tetrad for my recording but the maps are sub-divided into 2 Km tetrads. I hope that this mapping will aid any future conservation work which may be necessary.

Sussex is a very under-worked county for Hymenoptera. So far I have only recorded from my own collecting but I would be pleased to receive records (post 1960), from any other Hymenopterists or interested persons. I collect adult specimens during the Summer and nests in bramble stems during the Winter. So far the majority of my records have come from a strip of the county from Bognor Regis, on the coast, through Chichester, to Midhurst. This cuts across the three major habitat areas of West Sussex, i.e. the Coastal Plain, the Downs and the Weald.

Travelling from the coast inland one first crosses the Coastal Plain. This is mainly recently-drained salt marsh with occasional gravel and sand terraces which mark the Raised Beach Levels deposited since the last Ice Age.

Perhaps because of its recent formation several plants and animals which are found commonly elsewhere in the county do not occur in the Plain, despite apparently suitable conditions (e.g. Common green grasshopper and Orange-tip butterfly, amongst familiar insects).

I am not able to say whether this is true for the Aculeata at this stage. My list for the area, however, contains several notable species, some of which I have not yet found elsewhere.

There are two small areas of dune coast, one at the western edge and one at the eastern edge of the county; the latter has a large population of *Psithyrus rupestris* Fab. which is a cuckoo parasite of *Bombus lapidarius* L. the Large red-tailed bumblebee; *Episyron rufipes* L. a fairly large spider-hunting wasp is also found here. In the Bognor Regis area I have taken *Stelis punctulatissima* K., a kleptoparasitic (see note at end) bee which attacks bees of the genus *Osmia; Sapyga quinquepunctata* Fab., a kleptoparasitic wasp which attacks bees of the genera *Osmia* and *Hylaeus* (=*Prosopis*) and, from a rotten appletree log, I bred a series of *Omalus violaceus* Scop. which were acting as kleptoparasites of a ubiquitous Crabronid wasp, *Ectemnius cavifrons* Thomson. This same log produced an interesting parasitic fly, *Macronichia ungulans* Pand., which was parasitising *Pemphrenon lugubris* Fab. Some of these specimens of *O. violaceus* and one of *M. ungulans* have been presented to the National collection.

Further along the coast towards Portsmouth I collected two nests of a scarce bramble-nesting Crabronid, *Ectemnius rubicola* Dufour and Perris.

The raised beach levels at the foot of the Downs have been extensively worked for gravel and disused pits can provide rich hunting grounds. In one such pit I have found hibernating *Ceratina cynea* Kirby, a small blue carpenter bee, the only British representative of this genus.

The finding of *Ceratina* leads naturally on to the Downland areas, as these are the habitats where I first searched for this bee, at the suggestion of Mr. George Else, who will be publishing a survey of *C. cyanea* shortly.

Suitable habitat for this and other interesting species is south-facing natural downland turf with occasional bramble bushes. My winter bramble hunts on the few remaining south-facing slopes of downland have produced several localities for this interesting bee. Such places and methods, as well as providing a ready source of several of our commoner solitary wasps, have produced *Hoplitis claviventris* Thomson (=*Osmia leucomelana* of British authors, misidentified) from both East and West Sussex and its cleptoparasite *Stelis ornatula* Klug. Other interesting species recorded so far are *Heriades truncoroum* L., a small wood-boring bee, *Ectemnius rubicola* Dufour and Perris and *Andrena bucephela* Steph. This bee has unusual nesting habits; in all *Andrena* bees the female makes her own nest burrows, there are no castes, some species will make burrows all grouped together and *bucephela* goes one further—all the females use the same main entrance and individual tunnels split off the main one.

Leaving the Downs and travelling northward we come to the Wealden area. This is most notable for its sandstone heaths. There are some classical areas for aculeates in East Sussex on the Hastings beds but I have found these to be generally colder and wetter, partly because of the clayey nature of the sandstone, and consequently not so good for Aculeata. In West Sussex the sandstone belongs to the Lower Greensand (Bagshott Beds), and gives rise to very hot, dry, sandy commons with banks of soft sandstone where the rock is exposed. Many of the heaths are too dry for bracken and have escaped the fate of the clayier ones.

On such commons I have taken *Hoplitis claviventris* Th.; *C. cyanea; Oxybelus mandibularis* (Dahlbom), a Crabronid wasp which captures Diptera; *Eumenes coarctatus* L., the Heath potter wasp, which constructs pot-like nests out of mud attached to heather stems; *Methocha ichneumonides* Ltr. which has an extremely well-armoured wingless female.

Fig. 1. Nest of *Hoplitis claviventris*, Thompson, in dead bramble stem (x1). (a) Entrance tunnel. (b) Chewed plant fibres forming end plug. (c) Cocoon. (d) Cell plug.
Fig. 2. Cocoon of *Hoplitis claviventris*. (x4). (a) Cocoon cap.
Fig. 3. Cocoon of *Stelis ornatula* Klug. (x4).
Fig. 4. Hoplitis claviventris (Th.) ♀ (x4).
Fig. 6. Methocha ichneumonides Latr. ♀ (x4).

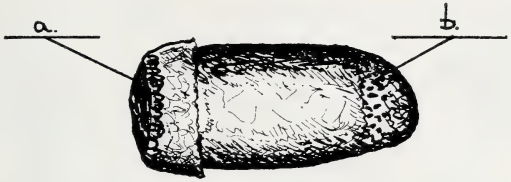


Fig. 2.

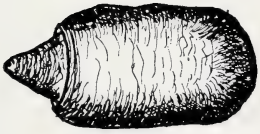


Fig. 3.

Fig 6.

Fig. 1.

Fig. 4

which preys on the larva of the Tiger beetle, *Cicindela campestris* L. a rosy-green Chrysid, *Hedychiridium ardens* Latr. in Coquebert, cleptoparasitic on *Tachysphex pompiliformis* Panz. and *Miscophus concolor* Dahl. an extremely small Sphecid wasp. From one of the sandy banks I have bred a series of the large form of *Trypoxylon figulus* L. This has a female which is commonly 2 cm long, compared with the 1 cm of bramble-bred specimens.

Because all the above species are fairly rare (except *Trypoxylon*), many are new records for Sussex and these are listed in Table 1.

TABLE 1
New Sussex Aculeata records

CHRYSIDIDAE				
Omalus violaceus Scop.	1 F.		June, '74	Bognor Regis
Hedychiridium ardens Latr. in Coq.				
	1 F.		22-8-74	Weavers Down, Rake
SCOLICIDEA				
Methocla ichneumonides Latr.	1 F.		29-7-74	Ambersham Common
	1 F.		22-8-74	Weavers Down, Rake
Sapyga quinquepunctata Fab.	2 F.		14-6-73	Bognor Regis
POMPILOIDEA				
Epysyron rufipes L.	1 F.		22-8-74	Weavers Down, Rake
	2 F.	1 M.	15-8-74	Camber Dunes
	3 F.	3 M.	16-8-74	Camber Dunes
VESPOIDEA				
Eumenes coarctatus L.	1 F.		6-7-74	Ambersham Common
	2 F.		21-8-74	Iping Common
	1 F.		22-8-74	Weavers Down, Rake
SPHECOIDEA				
Miscopnus concolor Dahlbom	1 F.		9-6-74	Ambersham Common
	1 F.		6-7-74	Ambersham Common
		1 M.	24-8-74	Iping Common
	4 F.	2 M.	22-8-74	Weavers Down, Rake
Oxybelis mandibularis Dahlbom		1 M.	6-4-74	Ambersham Common
Ectemnius rubicola Dufour and Perris				
	1 F.		14-7-74	Court Hill, East Dean
		3 M.	June, '74	Prinstead
ANDRENIDAE				
Andrena bucephala Steph.	3 F.	3 M.	11-5-74	Arundel Park
XYLOCOPIDAE				
Ceratina cyanea Kirby	Records included in G Else's paper			
MEGACHILIDAE				
Stelis punctulatissima Kirby	1 F.		23-6-73	Bognor Regis
Stelis ornatula Klug	One failed cocoon			Levin Down
Hoplitis claviventris Thomson	1 F.		11-6-74	Levin Down
	1 F.		29-7-74	Ambersham Common
	1 M.		27-5-74	Ambersham Common
	Several nests collected January, '75,			Malling Hill, Lewes
Heriades truncorum L.	1 F.		30-7-74	Cocking
APIDAE				
Psithyrus rupestris Fab.		1 M.	21-7-74	Ditchling Beacon
		5 M.	15-8-74	Camber Dunes

Fig 5.

Fig. 7.

Fig 8.

Fig 9.

Fig. 5. Episyron rufipes (L.) ♀ (x4).
Fig. 7. Omalus violacens (Scopoli).
Fig. 8. Andrena bucephala, Stephens. ♀ (x4).
Fig. 9. Ectemnius rubicola (Dufour and Perris) ♀ (x4).

As I said at the beginning, any records which other collectors have for Sussex aculeates will be gratefully received—with six or four figure grid reference if possible. Collectors of other Orders, particularly those working with sweep nets, occasionally turn up interesting specimens; I have seen Dipterists take *E. rubicola* by sweeping on a dull rainy day which was no good for normal collecting methods. The same party also swept an interesting Cleptid (primitive aculeates which use sawfly larvae as prey) from the banks of the River Rother last Summer (1974).

I will gladly undertake identification of aculeates sent to me; please could they be pinned with legs (and wings if possible) drawn out—there is no need to use setting boards for drying. Locality, grid reference, date, and any flower records for each specimen as well, please.

I would like to thank all the people who have allowed me to collect on their property; the Sussex Trust for Collecting Permits and maps; Chris Haes for much help in selecting suitable areas, without which I would still be chasing round in circles; the British Museum (Natural History) for access to their collections, and Messrs. G. Else, K. M. Guichard and C. Vardy for help in determination of specimens.

Footnote:—the term Kleptoparasitic may be defined as the condition in which the egg of the parasite hatches before or with the host, but the parasite grub grows faster and eats most, if not all, of the host's food supply. Unhatched eggs may also be eaten. At no time does the parasite grub live inside its host.

M. Edwards (5248)

REARING THE LARGE NARCISSUS BULB FLY IN CAPTIVITY

The important features for successfully rearing the large narcissus bulb fly *Merodon equestris* Fab. are clean cages, strong light and plenty of food and a supply of water.

Adults reared in captivity or caught in the field do well in cages made from plastic sandwich boxes 23cm long x 14cm wide x 9cm high although smaller boxes will suffice. Small holes should be drilled in the lids or a large hole cut and muslin glued over it to provide ventilation. Adults require pollen food and buttercups provide a convenient and readily available source. Four to six flowers are placed in a 5cm x 2.5cm specimen tube and wedged in with moist folded tissue paper (which also provides water for the flies). A polyurethane painted wood block should be placed in the cage to prevent the horizontally placed specimen tube holding the buttercups rolling around and the tube should be so placed that the stalks of the buttercups are underneath so that the flowers receive water by gravity feed.

Sugar solution or honey solution (1: 1 to 2: 1 by weight and volume respectively of sugar or honey to water) can be provided in the plastic caps of 2.5cm diameter specimen tubes. It should be presented soaked in a small piece of tissue paper in the cap to prevent the flies from drowning in or being gummed up by the solution.

The cages should then be placed in a constant temperature room at between 22°C and 27°C under high intensity fluorescent lighting (60cm from a bank of 5 25 watt tubes is ideal). An alternative for those without access to such facilities is to substitute the plastic lid of each cage by a sheet of muslin held over the top by a length of string and a rubber band and to place this in a well ventilated greenhouse or glass frame making certain that the temperature never rises above about 30°C and that rain cannot enter the cages and drown the flies. Success is not so certain using this method as one dependant upon sunny weather for good mating conditions.

It is important that the cages be examined if not daily then at least

every second day and that dead buttercups be replaced and honey pots replaced as they begin to go mouldy. The adults may be seen mating in the cages or in specimen tubes if one tubes them when replacing flowers and honey. The female will readily lay the large white eggs under the honey pot, in the buttercup foliage and on the wood block—anywhere that there is a crevice to back her ovipositor into. The eggs are easily removed into a small specimen tube by means of a fine camel hair brush. It is at this point that one can appreciate why it is best to paint the wood block with a glossy polyurethane finish or a polyurethane based gloss paint as the eggs, which are adhesive when the female lays them, are made so much easier to remove. If the wood block is not so treated the eggs are difficult to remove from the crevices in the grain and are also more freely laid on the wood block by the female.

The eggs should then be stored dry in the specimen tube in whatever conditions that one wants to subject them to. Moistening the cork of the specimen tube is not advised as this encourages mould. The tubes should be examined daily especially about a week after laying as the larvae are then emerging and do not survive more than about 24 hours in the specimen tubes. These larvae may then be separated from the eggs in a glass petri dish (plastic petri dishes generate static electricity) using a camel hair brush and then placed on daffodil bulbs or placed in pots containing made up diets.

If one is interested in the genetics of this species it is convenient to place the larvae from different crosses on different batches of daffodils grown in deep seeed boxes or seed trays. The bulbs should be kept damp (but not too moist) to reduce larval mortality and should be kept covered to prevent contamination by wild bulb flies. Newspaper covering proves adequate for this purpose.

The following January when the larvae are fully grown the bulbs should be cut open and the larvae removed and placed in moist peat in muslin covered plastic jars. The soil should also be sifted for those larvae that have left the bulbs early or are migrating from one bulb to another. The larvae in the peat should then be stored in a shaded place away from the attention of birds until they have pupated in March. The adults will then emerge the following May, June and July.

The life cycle can be accelerated by removing the larvae from the bulbs in late November and early December and then placing the jars containing the larvae in a 25°C constant temperature room. Subjected to these conditions the adults emerge in about 28 days. The larvae do not need to be chilled for any time beforehand so whether they have had a long enough and cold enough spell outside to be considered for diapause or whether they are in a state of suspended animation and not in a true diapause state I do not know. Pairing of these adults is difficult. They will take hazel pollen but do not readily mate or lay fertile eggs. However, I have had success on both these counts so that given time and attention it should be possible to perfect a technique to obtain two generations a year.

D.L.T. Conn

SETTING MOTHS—CAN'T AFFORD IT—OR THE TIME?

In this day and age of constant price rises, which of course affects us entomologists just as much as anyone else, as all types of entomological equipment is constantly rising in price as is almost everything else,—I have personally developed a method of killing and setting moths, and butterflies, which cuts the cost from pounds to . . . wait for it . . . ZERO.

It is of course possible that other members have also 'discovered' or 'invented' this method also,—however I do not know of any personally. And also of course, if this article is published, I may not be too popular with dealers selling equipment for setting lepidoptera, but here goes anyway!

My method completely does away with such items of equipment as (a) killing fluid, (b) relaxing fluid, (c) relaxing boxes, and even setting boards, so it can already be seen the great saving one can have using it, as these can add up to quite a sum over the years.

The only 'equipment' used for my method can be found in almost any 'modern' home in Britain . . . either a fridge, or a freezer.

All one does is to get your perfect live specimen, place it in a plastic box a bit larger than the specimen, and place this in the *freezing* compartment of the fridge for about half an hour. The moth or butterfly will very quickly go into a deep sleep, as in a sudden cold spell, when almost all insects slow right down in movements etc., or as in the hibernating condition, and they will then very quickly and quite painlessly die—as compared to injecting killing fluids into larger moths etc., and waiting . . . Here it should be pointed out that if a freezer is used instead of a fridge, the antennae or legs may possibly fall off due to the extreme cold, and also as little as ten to fifteen minutes is quite sufficient. Having taken your now newly dead specimen out of the fridge/freezer, it should now be 'set' at once, and you will find that the wings are very easily moved in any direction without breaking off, (which will of course happen if left for a few days).

The specimen can now of course be easily set in the desired position. This again, does away with relaxing boxes and relaxing fluid. And to continue this 'cost cutting', try setting your specimen on one of those white square ceiling tiles, which are very cheap, and again, does away with quite expensive cork setting boards! Quite a good number of specimens can fit on one of these. Cellotape doubled (i.e. a length of about six or more inches doubled over, so that both sticky sides stick together, leaving a 'strip' of non-sticking tape) is ideal for the cheap 'setting' of wings, and you can see what is happening underneath. The specimens can then be moved after a time to the usual case or drawer, when they have set.

So it will be seen that using my method above, one can have a live specimen killed and set on the 'board' in well under one hour, in fact a few specimens can be done together in an hour, at no cost at all,—

something that may well interest those younger members who just haven't got the cash to buy the various bits and pieces necessary using the normal methods of killing and setting, but also I hope, of interest to many other members.

Here may I point out that I don't normally have anything whatsoever to do with set specimens, being a 'livestock only' member, interested solely in breeding, however I was recently especially asked for some set specimens of a species I had been breeding, so I 'developed' the above method, which has of course been fully tested by me,—in fact having 'set' a few moths, I was quite tempted to keep them for myself instead of sending them to the person who asked for them!

Wesley Caswell (3133)

FURTHER EXPERIENCES WITH COPAXA AND PHRICODIA

"In the February 1975 issue of the Bulletin, I stated that 'I hoped the adults (of *Copaxa lavendera* West.) would emerge in mid 1975'. In fact, they actually started to emerge, most annoyingly at the end of December 1974, just after Christmas. (I say annoyingly, because of course the larvae feed on oak, and although it was a very warm winter, there was certainly no oak available at that time!) However I need not have worried, for this proved to be a very disappointing species to me, for out of the six pupae I had, all hatched, but . . . five were perfect males, and the sixth a female . . . very badly crippled, its wings not expanding at all, and it did not of course pair. The difference in sexes is amazing in this species, and any 'outsider' to lepidoptera would swear they were completely different species. The male being brownish-grey, the female however being a beautiful yellow, though I did not of course see it in perfection unfortunately. To sum-up on this species then, I'm sorry to say I failed to breed it, though I did at least have the satisfaction of rearing it through the larvae stages, which apparently was quite an achievement, but who knows, perhaps I'll get some more ova another year and do it again with even more success!

The second species mentioned in my last article, *Phricodea rosea* South., did a bit better however, though I must emphasise the word 'bit better' as when I consider the number of pupae I had of this species, I'm afraid I did very poorly! The adults started to emerge on 21st June, (almost always in the morning between nine a.m. and mid-day) continuing to emerge throughout July and into early August. Getting this species to pair however was a real 'trial'. I started by the usual placing a pair in a large net pairing cage (circular and approx 4 foot high) and was sure that would do the trick as the female was already 'calling' by dusk. I fully expected to find them paired by morning . . . but no . . . unless that is, they paired and parted by dawn, as some species do, so I put the female in a cardboard box just in case . . . She did in fact lay quite a large batch of ova the following day, so I had good reason to hope these would be

fertile, however they quickly turned green and collapsed!

Further pairs were similarly tried, putting them again in the large pairing cage, and in small net cages, even in small cardboard boxes, and in warm places, airy places, damp places, etc. etc., but no, not a single pairing was obtained, and about a dozen pairs were 'wasted', hundreds of infertile ova being laid. About this time, (mid July) I was getting ready to go on holiday, and the day before I went a fresh pair of *rosea* emerged. By this time I had more or less given up in despair, so decided to leave them in the emergence cage (a small glass aquarium with a zinc top) as I had so many other things to do that evening. Looking in the cage just before I retired to bed, I couldn't believe my eyes . . . they had paired! At last I had accidentally discovered their requirements . . . a smallish glass aquarium with not much ventilation, and also the apparent necessity to leave them where they emerge without touching them. Further pairs later emerged and paired under these conditions, so it was not just one 'lucky' pair. However even when a pairing is obtained with this species, it does not mean complete success, as will be later seen in this article.

In my previous article on this species, I stated the sender said ova were laid in either green or white. In fact, the ova, when laid, are a beautiful cream colour, however they vary in colour later on very considerably, especially if not fertile. Most start cream, then go a dirty green. Some stay cream and collapse, while others don't! Fertile ova turn white (usually) and then change to Bluey-green before hatching. For some reason, with this species, the ova often develop all right and just as the young larvae begin chewing their way out of the ova, they die just failing to hatch. This happened to me with both ova laid by some of my females, and also with some wild ova sent from Mexico! I can only just now confirm (late August) that this species does in fact also *lay* green ova! That is to say, ova which are a lime green colour when laid, as opposed to ova which turn green a day or so later. This has in fact just happened with almost the last female I had to hatch, but strangely all other females laid cream coloured ova, so it seems to be only a very rare occurrance for the ova to be actually green when laid, but it does happen, as I have just found out! (These ova were of course infertile anyway, as by this time I did not have any males about).

The adult moth has a lovely orange/black striped body, which it curls up when disturbed to also show yellow bands. The wings are various shades of brown, with two 'bands' of white stripes across the forwings. The males are a more chocolate brown than the females. When disturbed they also have the habit of dropping to the ground as if dead, and may lie motionless for quite a long time, even if picked up and dropped. The head of the moth is covered in fluffy hair. The hind wings are more or less patternless, being an overall grey/brown. As has been stated, they pair at dusk, but are always parted by dawn, and lay about 200 ova each female.

This species caused me some 'identification trouble' earlier in the summer. I stated in my first article that it was *Phricodia rosea* of course. Shortly after this article was written, the Ministry of Agriculture wrote and informed me that this species had now been 'reclassed' as *Molippa rosea*. Later still however, I was doing some studying in the more 'private' part of the National History Museum, Kensington, where there are some ten million species of lepidoptera stored in cases, (which I should think would almost take a lifetime to just look at each specimen for a moment or so!) when here I 'discovered' both *Molippa rosea*, AND *Phricodia rosea* and both were completely different species, of that there is no doubt. So it appears that the ministry of Agriculture were wrong for once! Here may I give my apologies to anyone who obtained *rosea* ova from me during summer 1975 thinking they were *Molippa rosea*, whereas in fact they were *Phricodia rosea*. (Sometimes also called *Dirphia rosea*)—which may in fact be a more 'modern' name for it.

Finally, it should be added here that this is not in any way an easy species to breed in captivity. The female always 'calls' readily from dusk to dawn, but generally the males are just not interested! This will also be confirmed by other people whom I gave some pupae to, though once fertile ova are obtained AND they have hatched, the going is easy!

Wesley Caswell (3133)

MY EXPERIENCES WITH CECROPIA, REGALIS AND CYTHEREA

Crotch (1956) says of *Samia cecropia* L. "Beginners are nearly always successful in breeding it, but practised rearers lose their stock time after time! The deduction is that it should be treated exactly as if it were a British insect".

On the occasions I have reared the insect I have found that the easiest and most successful method is to keep the larvae in ordinary plastic boxes at room temperature. The only factors to note are that the larvae have large appetites and that they should not be crowded I never keep more than two fourth instar larvae in a 28 x 1(5 x 10 cm box).

As with cecropia, a great many other foreign silkmoths do not need any extra heat at all, even *Antheraea mylitta* Drury, larvae will thrive as long as they are kept humid enough and the summer is not a cold one. However, two species I have failed to rear do need extra heat at some stage in their cycle to force them along, otherwise the larvae will not have pupated before all the leaves have died. They are *Citheronia regalis* Fabr. and *Nudaurelia cytherea* Fabr.

In 1973 I sent for one dozen *C. regalis* ova which arrived on 17th August, ten of these were fertile and hatched on the 28th and 29th August. They were fed on hazel (*Corylus* sp) which was already becoming dry as it was nearing the end of the summer. The newly hatched larvae are large, 6-7 mm in length and when at rest resemble bird droppings as they bend in half so that the head is alongside the anal segment. When

disturbed the spines on the thoracic segments are raised and the front half of the larvae is shaken violently in an arc. The prolegs are also worthy of note being long and tubular, and when the larvae is viewed from above they can be seen protruding on either side of the body.

The larvae grew fairly slowly, on 17th September four had just moulted into the third instar, the remaining six were still in the second. They were placed in an airing cupboard (at 65°F) to speed up their growth and 'Smith's Elixir' (see Crotch 1956, Villiard 1969) was finely sprayed on the leaves using a toothbrush. (The Elixir is supposed to help provide nutrients to compensate for the old leaves.) As the larvae were still quite small any condensation was wiped out of the box before droplets became too large.

As the larvae grow the spines become smaller in relation to the body size, on entering the fourth instar the larvae change from a drab brown to a greener hue.

By 12th October one larvae was in the fifth instar and four were in the fourth, all the others having died. The larvae all seemed very small considering the tales I had heard concerning the size of this species and had begun to make less and less progress. By 19th October I had three left and these all perished within a few days, the last dying on 22nd October.

My experience with *Nudaurelia cytherea* Fabr. also occurred during 1973 and although I managed to keep the larvae going for a couple of weeks after the regalis had died they still eventually met with the same fate.

The life cycle of *cytherea* highlights even better the need to get slow maturing species started early.

On 22nd April four male and three female pupae were received andwere immediately placed in an indoor emerging cage and sprayed every twenty-four hours. From 11th May they were submerged in tepid water for five or more seconds every day in the hope of simulating the start of the rainy season when these moths emerge.

Finally on 21st July the first moth emerged, a male. Eggs were obtained from a mating on 30th July (the emergence of a female on 29th July was followed by a male hatching on the 30th) at a temperature of 60°F. The very large eggs were laid on the underside of the wooden frame at the top of the cage. Only seventy-four eggs in six batches were laid. Thirty ova were kept.

Although Crotch gives the wingspan of the species as 11 cm my females were up to 14 cm across. The remaining pupae hatched sporadically up until 23rd August when the last moth emerged.

The first three larvae did not hatch until 11th September, nearly six weeks after the last eggs were laid. They were reddish brown in colour, 5 mm in length.

The larvae ate a small amount of their eggshells before being removed to boxes containing rose leaves. I trimmed around the edges of the leaves to allow the juices to escape and encourage the young larva to feed.

Plate D. Larvae of *Nudaurelia cytherea* (photo by Brian Gardiner).

As more larvae hatched it became apparent that they were gregarious, feeding in a group on the top surface of a leaf, lying with their heads towards the edge, in a similar manner to Buff Tip (*Phalera bucephala* L.) larvae.

On 17th September the larvae were all feeding well. I began painting 'Smith's Elixir' on the underside of the leaves and the boxes of larvae were transferred to the airing cupboard in the hope they would mature before the leaves became too dry for them to eat.

By 28th September three larvae were in the second instar and all the others were preparing to moult into it. The larvae became less gregarious in the second instar.

Some of the larvae moulted into the third stadium on 12th October. In this instar the body is red/brown with black bands around the segments which are almost entirely covered by yellow and green/grey scales. More scales had appeared since the second instar (none in the first instar). The tubercules are black.

Although the larvae can grip well they are easily dislodged from their hold if the food is shaken to remove droppings.

Even though the rose leaves were getting more and more horny the larvae seemed unaffected until 25th October when, upon examining the boxes I found five dead larvae.

From then on I usually found one or more larvae dead each day when I cleaned them out.

On 3rd November one larvae moulted into the fourth stadium and another was preparing to do so. These two were the last larvae to die, on 7th November.

Amory Thomas (4683J)

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LARVAE OF AUTOMERIS—2—VINOSUS

The larvae of *A. vinosus* Conte are rather similar to the better known *A. naranja* Shaus (=*aurantiaca* Wey.) but the adult moths are smaller and strikingly different.

The larvae take from 6-8 weeks to feed up and form similar thin papery cocoons to *naranja*. They are gregarious in the first few instars but not markedly so in the larger stages. They survive best when fed on beech (*Fagus sylvaticus*) but also accept false acacia (*Robinia pseudoacacia*) and various *Prunus* spp. Privet (*Ligustrum* spp.) was refused.

The fullgrown larva is 5 cm long. The body, chalazae and their dense spines, apple green. The spines about 0.5 cm high, distinctly longer on the first thoracic segment. The head is a light blue-green. The spiracles are white but narrowly outlined with a pale pinky-brown. Prolegs a light, rather translucent brown, being darker towards the tips. There is a lateral line on the abdominal segments only which consists of a series of downward and backward facing diamond wedges, not quite reaching the next segment behind; these wedges being narrowly outlined a vandyke brown on three sides, are pink ventrally becoming white dorsally. The underside is vandyke brown liberally speckled with white spots. The legs (claspers) are green with the feet brown edged with black and fringed with white hairs. The anal segment has a vandyke brown encircling ring at its junction with the last abdominal segment, being otherwise a rather translucent buff colour.

The figure (Plate C.) is of a full grown larva and is twice natural size.

Brian O. C. Gardiner (225)

Plate C. Fullgrown larva of *Automeris vinosus* x2 (photo by Brian Gardiner).

NEW TECHNIQUES FOR BREEDING HETEROCERA WITH PARTICULAR REFERENCE TO SATURNIDAE

There is no magic formula that will give a lepidopterist one hundred per cent success when breeding *Saturnidae*, but there are methods that I have used which provide a greater degree of success.

Described here are techniques that are not usually found in books on the subject and, as I have only had the opportunity of experimenting over four summers in an attempt to improve the survival rate in my own breeding cages, I do not recommend that anyone should commit their whole stock to this system, but further research would be interesting on a number of different species.

Obtaining good pairings of Silkmoths is often left to chance, even by experienced lepidopterists, but you have to get it right first time if you don't want to find yourself purchasing dozens of pupae at today's high prices.

Although good information may be found in "A Silkmoth Rearer's Handbook", it is the technique involved that produces the best results rather than the size of the cage, temperature, etc. It really is amazing just how little space large moths require if the approach has been handled correctly.

My experiments have shown that it is not so much the pairing conditions that have to be right, but the emerging conditions.

Firstly I like to sex cocoons (see next paragraph) by cutting them open. Many breeders do not recommend this, but in practice I do not find it causes any problems and it is an essential for the technique that follows. Do not throw the cocoon itself away. By cutting off the top where the head rests (usually the thicker end) it is possible to return the pupa to the cocoon after sexing. "The lid" is not required. The whole insect is then placed under a two inch layer of moist peat.

My advice for sexing pupae is as follows: —
Hold the pupa with the wingcase facing you. Count the rings towards the tail. The first clear ring after the wingcase is No. 1. Look carefully at ring No. 4, if it appears to have an indent or small slit in the centre the resultant moth will be a female. If ring No. 4 is unmarked and similar to ring 3, then the resultant moth will be a male. The difference between the sexes is easier to see on some species than others.

This serves two purposes: 1. Keeping the pupa in the cocoon stops the peat pressing down on the pupa. 2. It also keeps the pupa moist and is superior to spraying as, in warm weather, sprayed cocoons dry out again very quickly. Even so, it is necessary to keep the peat moist all the time. Wintering cocoons seem to do better out of doors in a cool outhouse rather than a domestic refrigerator. If pupae are kept loose in airtight plastic boxes in the refrigerator they still tend to dry out quickly. However, when keeping them in an outhouse, beware of warm winters of the type we have been having recently.

Another problem is one of quantity. How many cocoons are required for a reasonable chance of securing a pairing? Many beginners, ordering from a dealer, obtain too few of any one species. They expect that one male and one female is all that is required. You may be lucky, but a perfect male and female have to hatch out at roughly the same time and with only one of each sex the chances are slim. The best combination is one female for every three males ordered, and even better is 2 females and 5 males if finances will run to it. In this way one hopes for a female to emerge first followed quickly by one of the males. Males that hatch out first are usually intent on escape and simply batter themselves to pieces and are no use for breeding after two or three days. Females stop "calling" after three to four days and start reluctant egg laying. The combination of two to five is best because if one female dies in the pupa or hatches out crippled the chance hasn't been lost.

Having obtained the right quantities and ensured the right conditions for emergence we can now consider the system.

Because we know the sex of our pupae we shall keep males and females in separate cages. It is important to understand the reason for this. If we have both males and females in the same cage the following might happen. (1) The female hatches out first (this is the ideal anyway) and within about 24 hours she will start calling. (2) Then a male emerges and, from the moment of his "birth", he is swamped with the scent from the calling female but, of course, he is not ready to pair even though the stimulant is there all the time he is drying his wings. But when he is ready we are to suppose that he becomes aware of the female for the first time. But this does not always seem to happen, and it is this simple failure of the male to respond to the female's scent that set me thinking. Has he simply become dulled to reception by her continual presence since his emergence, numbed into inaction, or is it just that the cage itself has become saturated with odour? Sometimes when there is a response from the male he seems quite unable to pinpoint the whereabouts of his prospective mate, and in this case it is partly caused by the simple fact that there is no proper dispersal of the scent. The parallel in human terms can be likened to looking for a smouldering cigarette in a roomful of smoke!

This is why I keep males and females in separate cages and the cages often in separate rooms.

The disadvantage of this is, of course, that no pairing can take place in the event of an unobserved emergence. But a good entomologist will keep an eye on his cages twice a day anyway!

This disadvantage can be turned to advantage, because now we have complete control over pairings—even to the point of selecting healthy couples (by that I usually mean largest) and there is no chance of finding that a cage containing two females is scattered with eggs and being uncertain as to which is the moth responsible.

There is a great chance that one of the males will hatch out first. In

order to keep it in the best possible condition for pairing, its metabolism can be slowed down to some degree by putting it in a small box near the top of a domestic refrigerator. Those species from warmer regions—notably *Actias selene* Hubn., *Samia cecropia* L. etc. quieten down considerably, but if your wife complains of rattling sounds emanating from the butter dish, it's best to return the moth to a larger cage!

Upon the emergence of a female, it is necessary to wait until she has dried her wings and then transfer her to a suitable pairing cage. The type and size of cage is not too important when using this method. I usually fashion mine from cardboard wine boxes, by cutting holes in three sides almost to the edges and glueing netting over. During this process keep her well away from emerging males. A careful watch is now kept for any signs of her calling and when this happens I choose the freshest male and introduce him to her (take care, for very fresh males will not be ready to mate sometimes for up to 24 hours after emergence). The introduction is made quietly and carefully avoiding disturbing the female. Despite our precautions a male can occasionally behave in a way that suggests he is blind to the whereabouts of the female. In this case an introduction by hand may be required whereby careful manipulation guides him the way to go. Nine times out of ten, this will be unnecessary and it is simply a matter of leaving the couple in a well-ventilated room.

Calling females may be recognized by looking for the extrusion of the scent gland at the tail; it is small, round and globular, often yellowish in colour and it will be seen to undulate in rhythm.

We have now satisfied both requirements of the system:

1. Our male has not lived with the scent from a calling female before this time.
2. The cage in which our male was placed was a clean one and had not become saturated with the scent of a calling female.

When the moths have separated, put the female in a roughened shoebox into which a few sprigs of the larval foodplant have been placed. I have read that this is not necessary but it might provide the stimulus for her to lay more, even though she will probably ignore its presence as far as egg-laying itself is concerned. All this is impossible to prove, as one cannot know after the event how many eggs she would have laid without the foodplant. Even so, in 1975 eggs from a caged specimen of *Hyles euphorbiae* L. were, without exception, carefully deposited on the foodplant provided.

Interbreeding is a problem which is often forgotten. Pairings are successful and eggs are laid in profusion, but fail to hatch. Bluntly speaking, pairings taken between brothers and sisters can produce some sterile ova, if not the first generation, then almost certainly the second. Our own British *Saturnia pavonia* L. seems to be very susceptible to this. If you only have the offspring of one pairing there is little that can be

done—but if two pairings have been secured then the answer is to keep the resultant larvae in separation throughout their lives and cross pair the next generation as shown in Fig. A below.

As a final point, don't forget the possibility of using your female to assemble males. Obviously you are not going to attract many *Attacus atlas* L. males in Wandsworth but *Mimas tiliae* L. may be another matter!

Many British moths may be assembled and there is little point in wasting precious time awaiting the emergence of a perfect male from your own stock when there is a strong possibility of the species being on the wing locally.

However, this entails extra work in keeping your pupae at pretty much the same temperature and conditions as prevail outside, as there is little point in 'forcing' a moth to emerge in March when the 'locals' are not on the wing until June.

I don't pretend that the notes given will prove successful every time. There are certain species which undobutedly require very special handling and conditions for breeding successfully.

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GENETICS EXPLAINED FOR LEPIDOPTERA BREEDING

Today, the amateur entomologist often finds himself faced with articles, some of great interest, on various aspects of varieties and forms, these can often be difficult to understand due to the terminology used, often needing constant reference to a standard textbook of genetics. The value of such a basic knowledge is a great advantage to the amateur breeder, for having caught or bred a rare var' he can manipulate its use in further breeding, to the advantage of collector and breeder alike. By working in this manner he can put his breeding stocks to a practical scientific use for even the professional entomologist may not have the time or the 'skill' to rear large numbers of a given species over many generations. Hence in this field the amateur can be of immense help in furthering our knowledge of lepidoptera genetics.

Every cell in an insect's body has a central area of organisation; this is the nucleus, in this body lie the chromosomes, these being essentially long molecules which are intimately involved in genetical inheritance. Normally, they occur as pairs in the cell, each pair consisting of two chromosomes which are exact replicas of each other. Therefore if the pair is split the two chromosomes would look exactly alike and contain equivalent information. The last statement is quite important as it is the chromosome which carries all the genetic information from one generation to the next, thus they are 'vehicles' of inheritance carrying the particulate units of inheritance—genes.

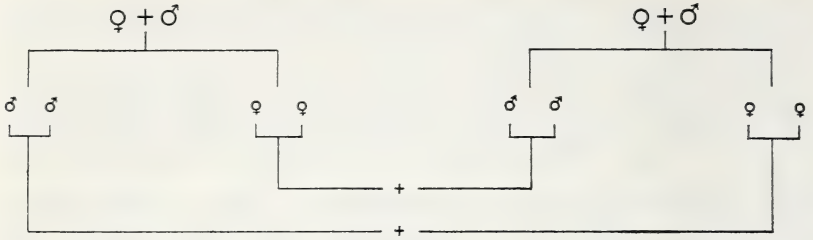
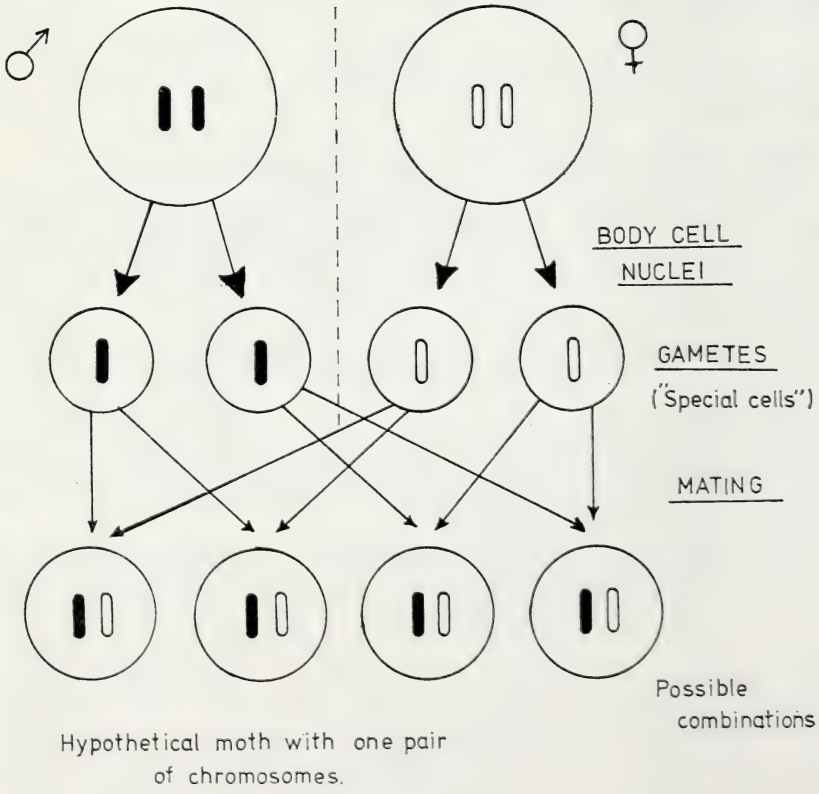


Fig A. Avoiding sterility through interbreeding.

Fig I

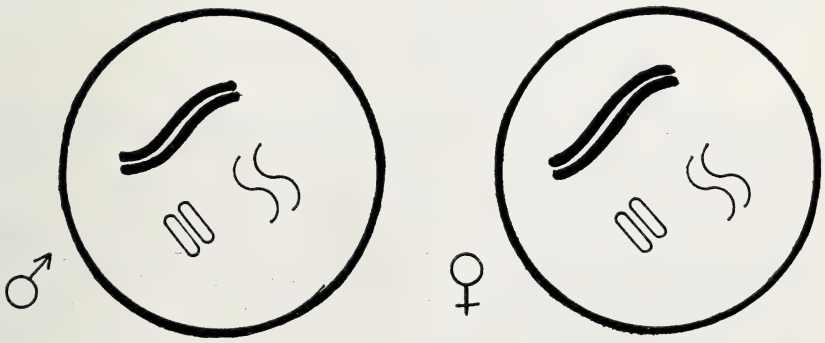


Hypothetical moth with one pair of chromosomes.

Most butterflies and moths have around 25 pairs of chromosomes in each cell, when an insect mates the situation is reversed and 'special' cells are formed, each containing only 25 single chromosomes (i.e., one from each pair). If a female produces these cells they are called eggs, likewise if a male produces them they are called sperms, in general these cells are referred to as gametes. On mating two gametes are brought together in one cell to reform a 'normal' type of cell, in this case containing 25 pairs of chromosomes. This step will produce a viable insect only if the gametes came from the same species, this is because the chromosomes have to join into pairs in the new cell and will not do so unless both chromosomes of the pair are exact replicas of each other. Having produced this new cell with paired chromosomes, the cell can now divide, duplicating the chromosome pairs at each division (hence maintaining the 25 pairs in each new cell), until a larva hatches from the ovum. The most important point to grasp is that a chromosome comes from both parents to reform the new pair in their offspring, the process by which they segregate in forming the gametes is entirely random. See Fig. 1.

Once it is understood how the chromosomes segregate we can consider the basic unit of inheritance, this is called the gene, it has been shown that these lie along the chromosome in the manner of beads on a string, the genes are material units of instruction for the formation of a new

Fig II



Body cell nuclei

3 Chromosomes to show that ♂ + ♀ of any given species have equivalent pairs of chromosomes.

insect. They can be considered as separate instructions in the 'manual' required to build the insect, using the 'bead' idea we can say that each chromosome of a pair has exactly the same number and position of, each bead, but each pair has different beads to any other pair. Very simply if only one gene is being considered at a time, accepting that each gene controls only one feature or character, then the gene will segregate in the same manner as chromosomes. Another implication of this system is that a character is represented by a pair of genes, this is a most important basic rule of genetics. See Fig. II.

Considering an hypothetical moth with two forms of wing colour, then if we accept that the wing colour is controlled by a pair of genes, these genes of the pair both occur at the same place on their respective chromosomes, and are equivalent in linear position on the chromosomes. If we say the moth with white wings is represented by 'WW' (i.e., both genes of the pair are of the type producing a white wing colour), likewise the form with black wings can be represented by 'BB'. This is a new idea to grasp, namely that a given gene can exist in several forms (these are later referred to as alleles), in this case both 'W' and 'B' are both forms of the same gene. See Fig. III.

It can be seen that the adult moths can have three different combinations of genes: —WW, BB and WB. Logically these should give white, black and grey wings respectively but this does not occur in the bulk of cases, and WB gives either pure white or pure black due to an idea called dominance. If a WB gave a white wing, then the gene type W (allele W) would be termed dominant to allele B, likewise the gene type B would be termed recessive to gene type W. Hence if allele W occurs with allele B then the effect of B is "overridden" by W, thus the moth's wing is white.

Overall: —WW gives *White* wings
WB gives *White* wings
BB gives *Black* wings.

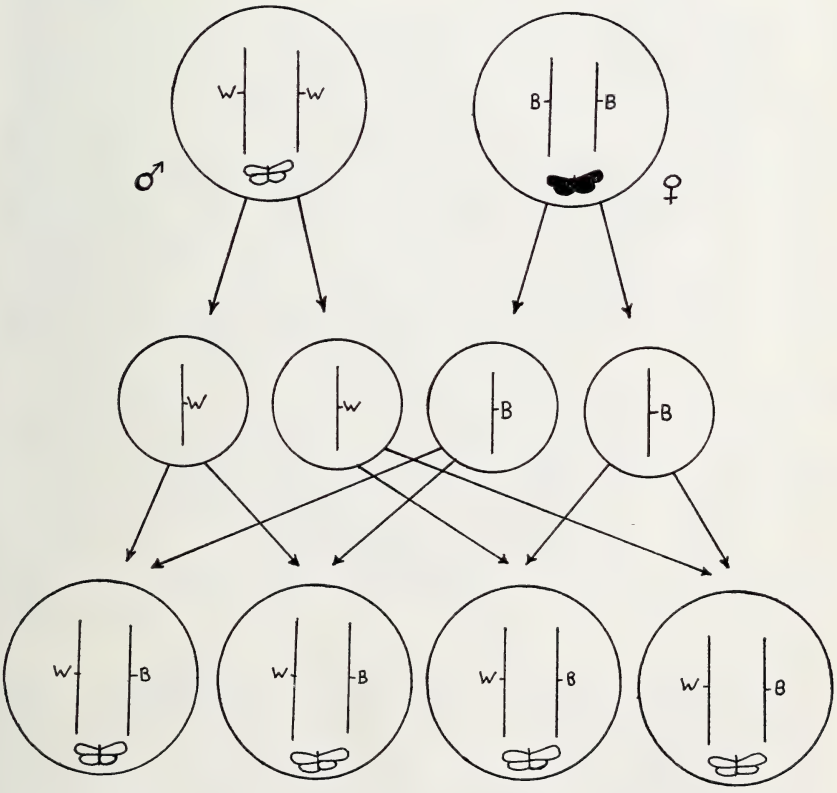
Due to the random nature in which the genes segregate the proportion of each form is seen as a 1: 2: 1 ratio (WW: WB: BB), and due to the dominance of W this is seen as a 3: 1 ratio of white to black. This is a simple case of straight-forward dominance in a single factor case.

Some more technical terms can now be considered, these are essentially names given to features already described, and are needed if further reading is to be undertaken. The pair of alleles (WW, WB, BB) are known as the genotype, i.e., the genotypes show a theoretical 1: 2: 1 ratio. The actual appearance of the insect is called the phenotype, and in this case there are two phenotypes, white or black wing, the phenotypes show a 3: 1 ratio in this case. Further, the genotypes with the same allele being represented in both members of the pair are called homozygous genotypes, conversely the WB genotype is said to be a heterozygous genotype. The homozygous pairs are referred to separately as homozygous recessive

Fig III

"W" ≡ W/

ie. "W" is a gene on a chromosome



Shown as :-

♂ WW → 'W'

♀ BB → 'B'

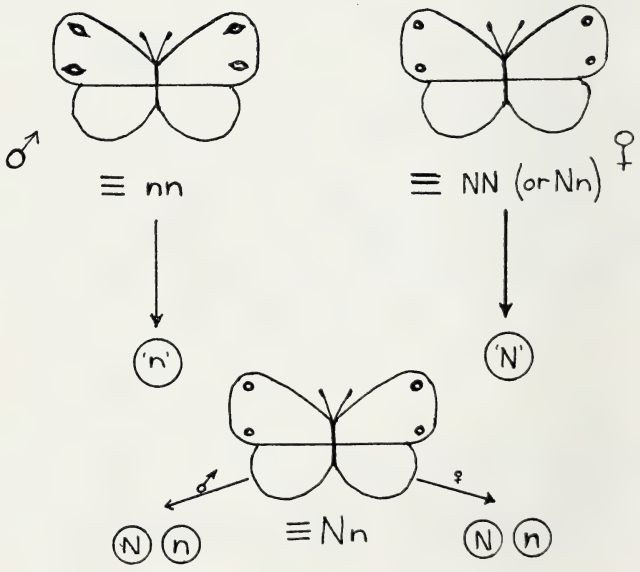
→ WB

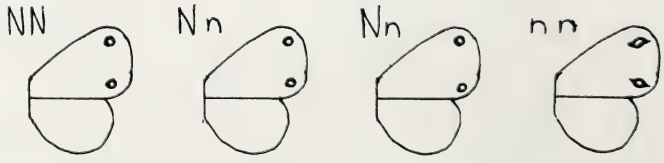
Where WW, WB + BB are termed GENOTYPES

or homozygous dominant, depending on the alleles (BB and WW respectively).

This is merely an outline of the basic idea of simple recessive inheritance, and provides a foundation on which to build. Some actual examples can now be used to illustrate these points—the butterfly *Aphantopus hyperanthus* L., has a well known variety with elongated eyespots, ab. *lanceolata* and it is believed that this form is a simple recessive to the normal form. Assuming the allele for normal eye-spots be N, then the lanceolata allele can be 'n' and the case is considered in Fig. IV.

Fig IV





Aphantopus hyperanthus L.

form lanceolata, diagrammatically shown

From this type of diagram can be seen all the theoretical ratios and thus if enough specimens are reared, then the forms should roughly agree with these ratios. The real advantage is in being able to know what to cross with what in order to breed desired forms, and to manipulate the breeding of uncommon forms should they appear in bred stock or in the wild.

K. Porter (4505)

BOOK REVIEWS

CARABOLOGIA Sommaire No. 1. January 1975. 44 pages with 63 illustrations.

This is a new publication devoted to the study of the Carabidae, and as such is bound to have limited appeal to the general Coleopterist; it is most definitely a specialist publication. The majority of British Coleopterists will be put off by the advanced degree of "hair-splitting". Issue No. 1 carries a fine colour illustration of a *Carabus* on the front cover, however the mind boggles when turning to the inside of the cover for one learns that its name is not *Carabus hispanus* but *Carabus* (*Chrysotribax*) *hispanus* (*hispanus*) *hispanus latissimus* Lap. X *Carabus* (*Chrysotribax*) *hispanus* (*rutilans*) *rutilans brevicollis* Lap. (=*croesus* Ob.) Linnaeus, I am sure, never thought his simple and workable system would (?) progress to these depths of refinement. Unfortunately the journal is stuffed full of these polynomial tongue-twisters of names.

The magazine is well produced on good quality paper, the text being entirely in French—no summaries or abstracts in other languages. The 63 monochrome illustrations are of good quality, and many of the pit-falls inherent with macrophotography have been skilfully avoided, the results being refreshingly clear, and not over enlarged. However some indication of magnification or scale should have been included.

Carabologia is to be obtained from C.C.P. Montpellier 2073-90, Michel Tarrier, Superbolquere F 66210 Mont-Louis, France. Four issues (160 pages) costing Ff 85,00.

J. Cooter.

THE BUTTERFLIES AND MOTHS OF HAMPSHIRE AND THE ISLE OF WIGHT by B. Goater. 1975. E. W. Classey Ltd. Price £6.50.

With the possible exceptions of mountains and cliffs, Hampshire possesses every recognized habitat for butterflies and moths: with the South Downs, New Forest, the Forest of Bere, the Hayling Island and Vectis sands it must surely be the richest county in Britain. What a disgrace that we have had to wait seventy-five years after the Victoria County History for a complete coverage of its lepidoptera! Although William Fassnidge's lists included all but the Tineina, they were published in parts in various journals and are now quite inaccessible.

Thus, for me as a Hampshire lepidopterist, this *opus magnus* has filled

a great lacuna in the literature, and given new impetus and direction to my efforts—my 'new' species are easily assessed for importance (and credibility), my unintentional aggregates are sorted out and so on. Mr. Goater's ideas on presentation are sound: the vice-counties, of which Hampshire has three, are adhered to, and for all but the commonest species, each locality is listed with date and recorder. He has chosen to avoid maps, pointing out that no records based on $2\frac{1}{2}$ kilometre squares, the largest suitable unit, are available and that records such as 'Winchester' could lie anywhere within a five-mile radius. Another good reason would seem to be that the outline of Hampshire is not a very familiar shape, and a dot somewhere near the middle would mean nothing to anyone but the savant. He has, however, provided two most useful maps—one of the geology of the county, and the other showing the principal names used—essential if places such as Sway and Chandlers Ford are to mean anything to anyone except the Hampshire Hog. 'Beginners' and old salts alike will be relieved to see that the vernacular names, which are given for all the 'macros' and butterflies, are the familiar ones of South etc. and not the recent systematized concoctions. The entries are well spaced and with good margins, allowing plenty of room for marginal notes and additions. I am pleased to see jet black printing on dead white paper, and a modern typeface that is quick and pleasant to read. With over fifteen hundred species arranged in taxonomic order (which unfortunately does mean that the butterflies are in the middle), a great deal depends on the indices. There are two, one for the vernacular names, and the other including the genera, species and selected synonyms, and they perform adequately. There is an appendix listing the localities given in the text together with their grid references, which may be useful to the non-Hampshire man making a special study.

I am left with two criticisms. The first, which lies more at my own door as a Hampshire lepidopterist than with the author, is that there is obviously a number of recent records missing. Every effort was made to contact Hampshire lepidopterists, and others who had worked here, and yet once again it is the same faithful few who have done all the work—and they mostly, very busy people. Without naming names, it may only be said that there are several well known entomologists with a great deal of experience who have contributed nothing. I am delighted to see that a supplement is planned, and I hope that they, like me, will be shamed into 'spilling the beans'. The second criticism, and a very minor one it is, is that I should have liked to see the vernacular names for a few of the micros included, where these are in common useage—Diamond-backed moth, Codling moth, Meal moth and Mother-of-Pearl are obvious examples.

For Hampshire lepidopterists this is an 'absolute must', and I would recommend it as engaging reading and a valuable model for anyone else.

R.J.D.

BUMBLEBEES by Dr. D. V. Alford. Davis-Poynter, 1975. Price £25.00.

I really feel that some sort of protest should be made concerning this book. It would appear that the publishers are trying to cash in on expensive rubbish and have served their author badly. From the pre-publication publicity I expected it to contain some considerable new material—"the first comprehensive and definitive study of these insects for over sixty years". Instead, I find a book which could be largely made up from three inexpensive texts: "Bumblebees", Free and Butler (New Naturalist, c. £2); Bumblebee Distribution Maps (B.R.A., 90p); "Guide to the British Species", D. V. Alford (B.R.A., 45p). The last-named may now be out of print; I will gladly loan my copy for photo-copying.

So much for the contents of the book. Now for its quality and general presentation. The price of this book is in no way reflected in its quality. At £25 it is, I think, reasonable to expect it to be printed on decent paper. What you get, in fact, is a quality similar to that of post-war publications —such as the first New Naturalist series—where the paper is of a rough, "unfinished" texture and the print from one page tends to show through on the backing one. The photographs are much praised. Why, I can't understand; most of the black and white plates are reasonably clear but some of the habitat shots in particular are nothing but a confused blurr—not helped by the fact that they are printed on cheap matt paper. The colour plates have very poor depth to them, being likewise printed on matt paper, and are most disappointing; the best parts of the book, I feel, are the line drawings which are very clear. Even some of these are cut into the margins.

Of course there is new material in this book which needed publication, but I feel very strongly that Dr. Alford should have even considered having his work published at what appears to be a "Collector's" price when I would hope that it was meant for serious use by entomologists and other interested persons. Lest it be thought that I am merely feeling piqued at having spent £25 on a publication which is, in the main, an amalgamation of three that I already possess, let me add that I was able to find a review copy which was unneeded and priced at £10; had I paid that price in a shop I would still have felt cheated.

M. Edwards (5248)

THE DICTIONARY OF BUTTERFLIES AND MOTHS IN COLOUR, by Eric Laithwaite, Alan Watson and Paul E. S. Whalley. pp. i-xlvi; 147-296; 146 cold. plates; Royal 4to. Michael Joseph Ltd. London. Price £12.50.

This is a magnificent book. Quite apart from having three authors it has clearly been a co-operative venture of quite a number of people having been designed and produced by George Rainbird Ltd., printed in the Netherlands and bound in England.

The senior author is perhaps better known for his work on, and

advocacy of, the linear electric motor. Nevertheless he is a keen and experienced amateur entomologist and he is responsible for the very extensive introduction to the book. This is extremely well written in a clear, interesting and indeed anecdotal style. Its writer shows that not only has he read and understood very widely, but also that he is bang up to date with recent research concerning the Lepidoptera and presents it with an entirely new and fresh approach, very readable and in a form which can be understood by all and sundry. This introduction is so interesting, not to mention thought-provoking that it deserves to be read right through.

To take but one example which must but provoke thoughts in the minds of all breeders of insects. "Even vegetarians 'murder' for most of them like their grass plucked from the living plant, in preference to the dead, discarded leaves of autumn. The rapidity with which the herbage begins to change chemically after removal from the parent plant can be demonstrated easily whilst mowing a lawn. By the time the grass box is full, there is a detectable temperature rise in the grass at the bottom of the box, and an animal, such as a rabbit, with a delicate palate, will refuse it if there is 'live' grass as alternative." Here then is the seeds of an explanation of why some caterpillars are so difficult to rear. Why some people are so much more successful than others in rearing certain species. Use of growing potted foodplant or perhaps just simply conscientiously changing the pabulum night and morning!

The Dictionary section is by Allan Watson and Paul Whalley, both well known entomologists at the Natural History Museum. Over two thousand species are specified under alphabetic order of genera. Species names and English vernacular names are copiously cross-indexed. Brief accounts are given of Family, sub-family, genus, and species. Geographical distribution is given and the wingspan is quoted in both decimal millimetres and in inches. Particularly useful is the informaton on foodplants and indeed it is helpful to know when the early stages are not known as this is in itself an encouragement to try and rear the species, should the opportunity present itself, and find out. It is surprising really how much useful biological information is packed into such a concise text without it having become too disjointed by over abbreviation.

There are over 160,000 species of Lepidoptera. Not even Dr. Seitz, with his sixteen huge volumes covering only the so-called "Macros" managed to cover them all. This book is therefore but the personal selection of the authors. They have chosen well and the selection of a mere two thousand species does in fact cover far more ground than is at first apparent, for under the family Lycaenidae for instance are listed many of the genera to be found in it and under genera is given an estimate of the number of species contained in it. Not all the species mentioned are illustrated and the brief colour descriptions given are therefore useful.

For perhaps the first time in a book on the Lepidoptera the 'micros'

have been given a decent share of the available space and this is very welcome indeed as it is high time this rather artificial division which is without scientific foundaton was broken down.

The magnificence of this book lies in its 146 coloured plates. These are more or less equally divided between natural photographs of butterflies and moths and a series of set specimens. These latter have clearly been carefully selected and tastfully arranged for photographing and Peter York is to be congratulated on his photography of them. They are done on a unicolorous light background, which certainly gives uniformity, but does lead to a fuzzing of the wing margins of very light coloured species, as for instance, Fig. 63. The general selection and effect, however, is excellent.

The other half of the photos are of live specimens at rest or sunning themselves. They vary in size from full page to half-a-dozen or so on a page. Naturally enough the selection has to be from what is available. It is surprising how much varied and excellent material the authors have managed to get hold of. There is a distinct bias towards the butterflies. They comprise but ten percent of the Lepidoptera yet occupy some fifty percent of the plates. Naturally enough they are the more colourful and this book is meant as much—or more—for the general public rather than for the 'pure' entomologist and anyway ninety percent of butterflies are colourful as opposed to ten percent of moths! The plates are superbly printed and really are a magnificent example of the colour printer's art and in my opinion clearly show their superiority in many respects to coloured paintings even when these be equally well printed.

In almost any book one can find something to criticize and that is true of this one. Two of the faults are minor, but the third is major and it is the hope of this reviewer that the publishers will see that they are corrected in future editions.

Firstly, I do not like books that commence, so to speak, on page 147. It is, of course, obvious that the first 146 pages consist of the coloured plates, but then they should be so numbered.

Secondly, in his introduction Prof. Laithwaite continually refers to plate so and so when he really means Figure so and so. A pedantic criticism perhaps, but to my mind the word plate implies the whole page.

Thirdly, and this is the most serious fault; there is no indication of size at all on any of the Figures on the plates. Yes indeed, size is given in the text of the Dictionary section, but to the casual browser, particularly of the non-entomological kind, misleading impressions can be given. I open the book at random. Fig. 106 on the left depicts *Papilio* (Swallowtails) to a larger size than *Ornithoptera* (Birdwings) which are on the right hand page. To take another example, are so many skippers (Figs. 82-89) really as big as the Swallowtails (Figs. 90-93) on the same pages? I think not! It is quite to be appreciated that with photographs drawn from a variety of sources it may not always have been possible to get the actual magnifica-

tion of some of them, but some half of all the figures are of set specimens photographed in groups and with these it should have been possible. Plate one gives the misleading impression that *Micropteryx calthella* is larger than *M. andeschella* by a factor of about ten! It would also have been useful to have had an alphabetical index to the species figured on the plates.

The text is very well printed and layed out, the Introduction in double, the Dictionary in triple columns to the page. The binding is reasonable in a nice plastic imitation of brown leather. The price for all those coloured plates and the neither easy to type-set or proof-read Dictionary, is extremely reasonable for these days of inflation and in comparison with other books on the market. This is a book to be both used and enjoyed and without doubt should be in the library of all Lepidopterists and too of every nature lover or just admirer of beautiful things.

BOCG.

NOTES AND OBSERVATIONS

DESERT LOCUST FOOD.—It is generally stated, and the instruction is usually followed, that Desert locusts (*Schistocerca gregaria* Forsk.) should be reared on graminaceous plants; Grass in other words; supplemented with bran. Why? Locusts after all were one of the plagues of Egypt. They devour all before them, I have therefore reared several thousands of Desert locusts on various other foodplants, with entire success, without using bran at all. It is also quite clear that they do show certain preferences and will only eat some plants if really hungry. Amongst those they are not keen on is, unfortunately, Privet (*Ligustrum ovifolium*), which would otherwise make a good winter food. The most successful rearings were on three widely disparate species. Great sallow (*Salix caprea*), Comfrey (*Symphytum asperum*), Cabbage (*Brassicae* spp.). Other broods were brought up on a mixed diet of common garden weeds and it is also possible to rear them on artificial caterpillar diet as used for *Pieris brassicae* L. and the dried pellets sold for rearing rabbits are entirely suitable for the older stages at least, provided water is also supplied.—Brian O. C. Gardiner (225)

CLOUDED YELLOW RECORDED IN COVENTRY.—It was in 1943 that I last reported seeing the Clouded yellow (*Colias crocea* L.) in a Coventry garden, although in 1957 quite a number were caught, including several Pale clouded yellows (*C. hyale* L.). Once again I am pleased to report that, on September 6th, 1975, as I was guarding about one dozen Small tortoiseshells that were on the flowers of one of the Buddleia bushes in my garden, since I had previously been troubled with birds swooping down and picking the Small tortoiseshells off the flowers, I saw a Clouded yellow fly up the garden and settle on one of the Buddleia flowers, only to be disturbed almost immediately by a Small white

(*Pieris rapae* L.) that caused it to fly away. This year I have also had three Painted ladies (*Vanessa cardui* L.) at the same time on the Buddleia, but only two Red admirals (*V. atalanta* L.) and five Peacocks (*Inachis io* L.). The reason I was watching over the Small tortoiseshells, I had been to the trouble to rear and release 183 as well as 39 Peacocks several days previously—so once again it is not always the collector who is to blame for "No" butterflies.—C. J. Willshire (420)

NOTES ON REARING LACKEY MOTH.—On May 25th last year I found a large nest of Lackey moth larvae (*Malacosoma neustria* L.). As soon as I touched the nest, which was spun up amongst grass and bramble, the larvae raced madly about and some dropped off and curled up. They were mostly full-grown and about 4-5 cm in length; a few were in their 4th instar and about 3 cm in length. The nest was found on a cliff above Whitesands bay, Cornwall during cloudy weather. I snipped off the nest and collected about 20 larvae. When disturbed they waved their heads about and displayed the eye spots on their head. They had blue and orange stripes along the body, with a white line down the back and were covered in soft, brown hair. They were reared on Bramble and Hawthorn. They pupated between June 11th and 26th and spun white, double cocoons, covered in a yellow powder. Pupation occurred in leaves, on cardboard and on the netting of the cage. Once two larvae pupated in the same cocoon and one fell out. The first moth to emerge was a crippled male on June 27th. The first female emerged on July 3rd and was brown with two dark lines across the wings. She was mated by a light coloured male assembled while I was in Dorset, but died before laying eggs. Out of all the pupae obtained only two were males and one of these mated no less than six times; the other only once. Pairing lasted for about 4 hours. The eggs were laid in tight collars around twigs in the morning. Some eggs were laid singly or in groups of 3 or 4. When first laid, the eggs are yellow but quickly turn grey and white. The eggs are now overwintering and I have about 200.—Gary King (5654 J)

FLOUNCED RUSTIC AT SUGAR.—On the evening of 20th September 1975 I sugared several posts and fences at Sea Palling, Norfolk; there was a full moon with cloudless sky and it was warm with no wind. The only visitor was a *Luperina testacea* D. & S. (Flounced Rustic), stated in South's Moths of the British Isles (1961 edition) as not known to visit any of the usual floral attractions or the collector's sugar.—P. A. Brown (4770 J)

CLITHERONIA REGALIS LARVAE FED ON ASH.—Out of a batch of a dozen or so ova, I now have 3 nearly fully grown larvae feeding very well on Ash. I had great difficulty in persuading them to take Ash (these were the only 3 that did), but once they begin feeding, they don't stop! —M. L. Schuyl (4806)

MORE WASP NOTES.—In reply to Mark Knight's letter on wasps on page 114 of the August last Bulletin, I can make these remarks. He mentions that while visitors to his house were stung, he and his wife were not. This may be because of the visitors' reaction to the wasps. Most people swot at wasps whenever they come near and this can incite an attack. A wasp will not sting unless it or, in most cases, its colony is in danger. Judging from his letter the Knights are not in the least perturbed by the presence of wasps. As such they will probably not provoke attacks with aggressive behaviour. A few species of social wasp will attack without provocation but these are confined to Asia and South America, fortunately! One such species, *Polybiodes*, was used in booby traps in the war in the far east (Spradbery, 1973; Evans & Eberhard, 1970).

R. B. Benson records that a nest of *Vespula paravespula vulgaris* has been observed to be made from woollen garments as well as the usual paper carton (Benson, 1946). Records also exist of nests made from cotton fibres from a curtain (Lith, 1956) and even of a nest made of confetti from a churchyard which turned out multi-coloured, a real case of adventitious foraging.

If any members want to know or find out anything about social wasps, I will be glad to help them.—David H. Squires (5368)

Spradbery, J.P. (1973). "Wasps". Sidgewick & Jackson. Evans & Eberhard (1970). "The Wasps." Univ. Michigan Press. Benson, R. B. (1946). *Trans. Herts. nat. hist. Soc.* **22,** 163. Lith, J. P. (1956). *Ent. Bericht.* **16,** 33-5.

MOTHS IN THE ORKNEY ISLANDS—JULY 1975.—A conventional Robinson mercury vapour moth trap was set up at Orkney Field Centre, Birsay, in the extreme north west of the Mainland. During our stay at the field centre, the trap was operated on only five nights due to adverse weather conditions, mainly high winds.

The surrounding area was not particularly suitable for moths. A total lack of trees and heather does not create a picture of an ideal trapping site, particularly when the only abundant vegetation was grass and that the seashore was only a couple of hundred yards away. However, the trap was switched on for five nights, and the following species were recorded.

1. Clouded Bordered Brindlle (*Apamea crenata* Hufn.)
2. Spectacle (*Unca triplasia* L.)
3. Beautiful Golden Y (*Plusia pulchina* Hübn.)
4. Purple Clay (*Diarsia brunnea* Schiff.)
5. Ingrailed Clay (*Diarsia mendica* Fab.)
6. Flame Shoulder (*Ochropleura plecta* L.)
7. Dusky Brocade (*Apamea remissa* Hübn.)
8. Setaceous Hebrew Character (*Amathes C-nigrum* L.)
9. Shears (*Hada nana* Hufn.)

10. Middle Barred Minor (*Procus fasciuncula* Haw.)
11. Silver Ground Carpet (*Xanthorhoe montanata* Schiff.)

Only three species, the Beautiful golden Y, Spectacle and Purple Clay were caught with any regularity, these species being recorded on every night. Also on three of the five nights was the Ingrailed Clay which exists as a subspecies in the Orkneys (*Diarsia mendica* subsp. *Orkneyensis* Bytinski-Salz), differing from those in England in that the pattern on the forewings is more clearly defined and the colouring in general is richer. The other species recorded did not differ from those caught in England.

On nights when trapping in England would have proved to be unsuitable, insects were being caught. On one night in particular, which was very misty and comparatively cold, nine species out of the total of eleven species recorded were found in the trap. The fact that moths fly in such adverse conditions show that they are more tolerant of wind and rain than their counterparts in the south. Moths will fly freely in heavy rain and fairly high wind here. It can be noted that out of the eleven species recorded, all but one, the Silver-ground carpet, belong to the family Noctuidae, small robust fast flying insects which are particularly well adapted to these conditions.

Probably the most valuable adaptation for adverse weather conditions in the Orkneys is that of prolonged emergence periods compared with the same species in the south, and the fact that they can be temporarily suspended during a break in the weather. Even a very short period of good weather (one day) seems sufficient to induce many moths to emerge. This was well illustrated one night after our hottest day there when ten Beautiful golden Y moths, all very fresh and in perfect condition (obviously just emerged) were caught. The previous night only one was caught, and the highest number caught in any one night had been four.

According to the Nature Conservancy report on the Orkney Islands 1974, all the species mentioned above are 'generally distributed' in the Orkneys.—M. L. Schuyl (4806)

LATE RECORDS—1975.—On the morning of 3rd October I examined the contents of my home-made light trap and was surprised to see a perfect female (*Agrotis puta* Hübn.), which unfortunately died several hours later.

While removing Dahlias from a bed in a Coventry park on 7th October, I disturbed and caught a worn *Noctua comes* Hübn., which was released after identification.—P. A. Brown (4770 J)

PRICE INCREASE.—We have been asked to point out by the publishers, Barry Shurlock & Co., that, with regret, due to increased costs, the price of two books reviewed in our August last issue have gone up to £1.90 each. These are *The Locust* and *Stick and Leaf Insects*. Copies at the old price may, of course, still be in the shops and it could be worth shopping around if anyone is still in need of a copy.—Editor.

SENDING LIVESTOCK BY POST.—Members and dealers despatch ova and larvae by post and our quarterly Wants & Exchanges list results in a lively interchange of such material. One of our members has complained that often such material is not sufficiently labelled as to the species enclosed or the foodplant necessary for survival. In the case of ova, if the species is properly indicated then the foodplant can be usually ascertained from relevant literature though even here a note as to the most likely pabulum available would be helpful. However, in the case of larvae, the foodplant enclosed with them is usually partly or totally devoured and unrecognizable and although a selection of foodplants may be known to the receiver, he may not know what the stock has been reared on to date and in many cases an abrupt change in pabulum may cause intestinal trouble among the larvae and often death. The writer would recommend that all livestock sent to others should bear on the container the species of insect with date of ovipositing or emergence of larvae, the source of the material and the botanical name of the food plant on which the stock is or has been reared, with likely alternatives where appropriate. Such helpful data would avoid much disappointment to receiver and ensure the well-being of the stock in question.—P.W.C.

MORE LACEWINGS.—Concerning my note on this subject on page 115 of Vol. 34 of our Bulletin, I must confess that the Chrysopidae are not as rare in Ireland as I had thought and I should like to thank Messrs. C. Moriarty and P. O. Connor for their help and advice. During the summer of 1975 I observed about two dozen Lacewings, so I wrote to the Natural History Museum in Dublin, who replied stating that they were common in Ireland, and at least nine species are represented in the Irish Fauna. I fear that I have been misguided by the Oxford book of Insects, which says that Lacewings are not found in Ireland.—J. Good (5398 J)

THE WILDLIFE OF ANY COUNTY has its own intrinsic value as a vital and continually changing resource. It concerns not only the natural historian and scientist, but everyone living or working in the area by providing a living background to the county and through man's association with it, the countryside which is an integral part of the total environment. Even in a county like Cambridgeshire which is exceptionally well known with records dating back to the seventeenth century, new information, from continued observation and survey is becoming available all the time. In dealing with a living, changing resource like wildlife, there will always be a need for continuous monitoring, survey and consultation.—Extract from the Cambridgeshire Structure Plan.

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THE AMATEUR ENTOMOLOGIST

Originally an annual publication (the Journal of the AES), containing longer articles than the "Bulletin". Now used as a serial title for the Society's Handbooks. Volumes available are listed below, but if out of print a second-hand copy may be sent.

Volume No.

7. **The Hymenopterist's Handbook.** Originally published in 1943, facsimile reprint 1969. This volume is a comprehensive guide to collecting, rearing and the study of ants, bees, wasps, sawflies, gall-wasps and parasitic Hymenoptera ; including keys to all the British families. 160 pp., 183 figs., 2 plates. Price : £1.80

8. Includes several leaflets that are now O.P.: **Collecting Dragonflies ; Collecting Mosquitoes ; Making Sweepnets ;** an 8 pp. list of standard books on entomology, etc. 48 pp., 32 figs., 6 plates. Price : 60p

9. **Practical Methods and Hints for Lepidopterists.** Containing articles on rearing and collecting larvae ; illustrated instructions for making beating trays and cages for all entomological purposes. 42 pp., 48 figs., 6 plates. Price : 60p

11. **A Coleopterists's Handbook.** Describes the tools and methods for collecting British beetles ; their habitats, commensals and pre-adult stages ; how to record, photograph, make a personal collection, and conduct a local survey. 120 pp., 50 figs., 20 plates. Price : £1.60

12. **A Silkmoth Rearer's Handbook.** By W. J. B. Crotch. How to breed 120 exotic species in Britain, including substitute foodplants and descriptions of stages. Systematic section refers to 1400 species. Does not deal with the Mulberry Silkworm (Bombyx mori), q.v. Leaflet No. 3. 165 pp., 26 figs., 24 plates. 2nd edition 1956. Facsimile reprint 1970, with coloured plates omitted. Price : £2.00

THE BULLETIN OF THE AMATEUR ENTOMOLOGIST'S SOCIETY

(World List abbreviation : Bull. amat. Ent. Soc.)

Past numbers of the Bulletin contain a wealth of detail on aspects of breeding insects, collecting methods, making equipment, introductions to the less well-known Orders and reports of collecting in the British Isles and abroad. Much of this information is invaluable to new members and back volumes are available at the prices set out below. Each volume is complete but if out of print a second-hand copy will be sent if available.

Vol. 6 (1944 to 1945) £4.00
Vol. 7 (1946 to 1948) £2.20
Annual volumes 8 (1949) to 28 (1969) per vol. 60p
Annual volumes 29 (1970) onwards per vol.... £1.20

Silver Jubilee Number contains contributions by Honorary Members and past Presidents : The First 25 Years ; Studying the Commoner Insects ; Butterfly Botany ; Communication Among Social Insects ; Some Observations on Taxonomy ; Distribution, Range and the British Fauna. 18 pp. 20p

Special Issue, August 1965 contains "A Guide to and Local List of Insects in North-west Cornwall" by G. D. Trebilcock, and "Insect Migration", a review by C. B. Williams. 80 pp. 6 maps. 40p

continuing on the next page

LEAFLETS PUBLISHED BY THE AMATEUR ENTOMOLOGISTS' SOCIETY

Numbers not included are out-of-print or replaced by others.

3.	Rearing Silkworms. (The Mulberry Silkmoth). 4 pp., 2 figs.	4p
4.	Collecting Sawflies. 12 pp., (incl. 2 pl.) 26 figs.	12p
5.	Collecting Flies (Diptera). 8 pp., 1 fig., 8 pl.	20p
6.	Collecting Beetles associated with Stored Food Products. 9 pp., 6 figs., 3 pl.	16p
7.	Some Improved Devices for Rearing Hymenoptera. 7 pp., 3 figs.	12p
10.	Experiments with Bees. 12 pp., 3 figs.	12p
13.	Collecting Microlepidoptera. 4 pp., 1 fig.	4p
14.	Setting Microlepidoptera. 4 pp., 5 figs.	4p
15.	Collecting Het-Bugs (Hemiptera-Heteroptera). 12 pp., (incl. 2 pl.) 5 figs.	16p
18.	Collecting Clearwings. 12 pp., (incl. 2 pl.), 4 figs.	12p
20.	Preserving Caterpillars. 14 pp. (incl. 6 pl.), 9 figs.	16p
21.	Collecting Psocoptera. 4 pp., 10 figs.	4p
22.	Collecting Lacewings. 9 pp, 8 figs., 5 pl.	16p
24.	Entomology of Bird Pellets. 8 pp., 4 pl., 1 map.	12p
25.	Collecting Bumble Bees. 20 pp., 83 figs.	28p
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27.	A Study of the Insects Living on the Wayfaring Tree. 20 pp., 4 figs., 1 diagram.	16p
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AES BULLETIN No. 311

EDITORIAL

OUR EXHIBITION — Once again it is not too early to remind members of this very popular annual event which this year will take place at a new venue. This change of scene is not of our choosing, the ILEA authorities having announced that Holland Park School is required for other purposes during term-time in future. Your organisers will of course make every effort to ensure that all runs smoothly in our new premises and would like to invite all members who possibly can to bring an exhibit. The mix will be as before; the actual positioning of the various activities remains to be seen, but of course we expect to provide our usual high standard of catering and other facilities. The organisers look forward to meeting old friends and meeting new ones at this great annual gathering of our society.

BOOK OUTPUT — The number of new books being published on Entomology remains at a high level and varies from the trivial through the sumptious to the erudite. Some are useful, some interesting, some essential, some useless or but of brief passing interest. The total cost of these books is enormous, in many cases the price is much higher than can be justified by inflation, and the average Entomologist has to be selective in his buying. There appears to be little relationship between the cost of the book and its quality; if anything the more sumptious ones tend to be the cheaper. Much of the price would appear to be due to heavy advertising. Your editor has received (to date) no less than 17 expensively produced brochures advertising one particular book. The AES Bulletin carries reviews of only a few of the books that are published. This is for various reasons, but unless the publishers are kind enough to send us a copy for review, our society, possessing no library of its own, must rely on the random contribution of a member who has bought the book. Unlike another society we do not accept free copies from a publisher in return for a free factual advertisement. Such a procedure destroys all objectivity since no unfavourable review is then possible. Book reviews published in the Bulletin are the candid opinion of the reviewer about the book in question, without fear or favour.

Prices of books given in reviews are those given us by the publishers or quoted in their advertisements. Some books, however, are often quoted at discount if paid for before a certain date, or if bought by members of certain organisations. Due to the Bulletin being a quarterly publication and the time it takes to produce, it is rarely possible for

a review to appear within six months of publication and quote these discounts. However, we have noted that many recently published books can be obtained at often very substantial discount prices in certain bookshops. Having decided to buy, the Entomologist could well save himself a few pounds on a book by searching around.

"HOW DID YOU JOIN THE A.E.S.?"—HERE'S MY STORY

Well, way back in 1959, such a long time ago it seems, I happened to be in hospital for quite some time for a major operation, and while there, I wrote to a magazine which I expect many of you will remember well, but no longer in existence these days, — the Boys Own paper, usually nicknamed the 'B.O.P.' for short. My story to them was about a pet rabbit I used to have which was friendly to other pets (dog, cats, etc.), but would chase any 'foreign' ones out of our garden should they venture in. (The rabbit was loose in the garden.) I also mentioned that I was interested in insects — though at that time I'd never heard of silkmoths and rearing them in England! Well, the editor 'accepted' my story and it was published in due course (and I still have it to this day — somewhere). Also, at that time, L. H. Newman, whom you will all know, or have heard of, was doing 'comments' at the end of these letters in the B.O.P. He wrote to me, and asked if I'd heard of the A.E.S., which I hadn't, and gave me their address. So shortly afterwards, I became a member. It was then, in late 1959, that I first wrote to a well-known name these days — Mr. Robert Goodden, who at that time was in Dartford, Kent, and of course Worldwide Butterflies did not exist then — he was just 'Robert C. Goodden — breeder of British and Foreign Lepidoptera'. Perhaps you would like me to go back in time for just a moment here, and see again what was on offer from Mr. Goodden in those far off days of spring, 1960. Well, from his list, I see that he had such English species as Lime, Poplar, Privet, and Eyed hawk livestock, ova of all these species at from 2/6 to 3/- a dozen! Pupae of these were from 8 pence, to one shilling each! The 'star' of his spring 1960 list for me though, was *Citheronia brisottii,* — the only foreign species on his list, apart from *S. planus* and one other. *C. brisottii,* then, was selling at 6/6 a dozen ova, 7/6 - 12/6 a dozen larvae, and pupae were selling at the terrible high price of 5/- each (now something more like £2 if you can get them at all!).

By now I was out of hospital, and I remember I 'went mad' and ordered a whole dozen of these, the most expensive species he had to offer — *C. brisottii.* I didn't know a thing about rearing tropical 'stuff' but I hoped to find out as I went along, as we all had to at one time! Unfortunately, Mr. Goodden only had six available larvae of *C. brisottii,* to offer me that year, and these he kindly sent me, though I had ordered ova so far as I can remember. Unfortunately, as you will no doubt

guess, they didn't last very long.

A little while later, after numerous letters to and from Mr. Goodden, he wrote and told me about the A.E.S. Exhibition, and invited me to go along to it, as it would be of great interest to me he said, and he also mentioned that he would be there. So off we set for the exhibition then, when the time arrived. In those days, the exhibition was held in the 'slum-like' area of Farringdon, in darkest London, and to get to the school, one had to walk along many dark narrow cobbled-stoned streets with such names as 'Bird Cage Walk', 'Bowling Green Lane' and so on, half expecting to be 'held-up' by some city thug at any moment, but always (for me anyway) arriving safely eventually at the school and up the stairs to the second floor where our exhibition was held in very cramped conditions.

Not at all like these days in 'posh' Kensington's Holland Park School! I was amazed at all the livestock etc. there, more than I ever thought existed, and purchased a huge *A. atlas* moth from Mr. Goodden, which I still have, though I'm afraid it is very faded these days!

Well, that is more or less the end of my story. I have continued in the A.E.S. ever since, and been to every single A.E.S. Exhibition since that first one I went to in 1960!

I know I owe quite a lot to Mr. Goodden, for if he had not invited me to that 'first' exhibition in 1960, it is very possible that I might never have started going to them, I would probably have thought, "Oh, just another crowd of people with a few moths and butterflies in cases, etc. — I can see those any day in the museum", — but what I would have missed . . . !

W. Caswell (3133)

COLLECTING NOTES—COLEOPTERA

On salt-marshes several species of beetle may be found in the spring that become less easy to find later on. The two species that I am going to deal with in this quarters "Collecting Notes" fit this pattern, they are the Histerid *Kissister minima* (Aubé), and the Pselaphid *Brachygluta helferi* (Schmidt-Goebel). Despite the rare and isolated inland records (e.g. *Entomologist's Monthly Magazine*, 96: 272) both are true salt-marsh dwellers. I have found them commonly at Pagham Harbour, West Sussex during late March by turning over the larger pieces of drift wood that rest on the grass above the normal tide strand-line.

B. helferi is perhaps the only Pselaphid to be found in this situation, and is easily recognised in the field by its red elytra.

K. minima may be found later in the spring and in the summer at the roots of *Rumex* by pulling up part of the plant and shaking it over the collecting sheet. It is easily recognised by its small size and rounded

shape. With the aid of the hand lens the four elytral striae should be visible.

Other beetles likely to be found in the same situation include *Halobrecta flavipes* (Thom.) and salt-marsh ladybirds. Under drift wood resting at the strand line or on bare mud *Dicheirotrichus gustavi* Crotch (*pubescens* (Paykull)), *Pogonus chalceus* (Marsham), *Bembidion minimum* (Fab.). *Amara convexiuscula* (Marsham); and *H. flavipes* (Thom.) often in numbers. J. Cooter (3290)

NOTES OF LARVAE OF CICINDELA CAMPESTRIS

I first discovered some green tiger beetle larvae burrowing near paths in a hilly area near Abergavenny in April, 1973. They were burrowing in a rather stony substrate of red clay. In April 1975 I examined the area slightly more carefully to try to find some possible sources of the larvae. Near all the burrows were mounds of earth built by the ant species *Lasius flavus*. *Myrmica ruginodis* nests were present farther along the hillside. Weather conditions were cloudy and overcast. Some small beetles were found near the burrow entrace: a *Notiophilus* species, *Harpalus aeneus* (probably too large to be taken by *Cicindela* larvae), and a *Bembidion* species (a little further down the hillside). The immediate vicinity of the burrows was also of interest. Pitfall trapping of ground beetles has indicated that most species are liable to be found in sites which offer little resistence to ground beetle activity, as catches tend to vary universely with resistance to activity. The surface of the ground around one of the burrows excavated in 1975 was smooth with no grass near the entrance. This housed a second year larva; the burrow was about 6-inches deep. Two other second year burrows were excavated, from near where the 6-inch burrow was found, but directly underneath a *Lasius flavus* mound. Ants were seen in the near vicinity of these two burrows, which were shallower than the first burrow excavated; both about 4-inches deep. The 4-inch burrows were only $1\frac{1}{4}$-inches approx. apart, and showed conical entrances formed from loose particles of soil. In the immediate vicinity of the 4-inch burrows were leaves of grass and small weeds.

When I first discovered the tiger beetle larvae in 1973 I excavated about six burrows; two I dug out complete and took them home to rear. These were also second year larvae. The burrows were kept in conditions of higher humidity and temperature than would be expected near Abergavenny. One of the larvae was removed from its red clay burrow and placed in a deep container containing a loosely compacted dark clay soil from my garden. It burrowed into this substrate to a depth of about 5-inches, and accepted the ants which were supplied to it until 19 May 1973 when it blocked its burrow entrance. A pupa was found in the burrow on 21 June, when the burrow was excavated, but this subsequently became infected with a white mould.

The other larva was allowed to remain in its native substrate of red clay, but it was also removed from its burrow — it soon dug another one and started feeding normally. It blocked its burrow on 17 May, with material from the interior of the burrow. This larva's burrow was also excavated on 19 June, 1973. The larva hadn't pupated, but it did so that same day and a normal-sized adult emerged two weeks later, on 3 July.

Feeding habits of the larvae: The tiger beetle larva will feed on small caterpillars and beetles, but I fed those I reared in captivity only on ants. The larvae would never pursue prey actively, and if a larva was deep in its burrow it would not "surface" when an ant was held over the surface of the burrow. A larva removed from its burrow would feed only if the ant was placed on the appropriate part of the dorsal surface of the head and prothorax, i.e. those parts exposed to the prey in the normal feeding situation. Feeding consisted of manipulating the prey into the vicinity of the mandibles, sometimes by active movement of the entire body, then snapping the mandibles closed very rapidly. If the prey was missed, as happened occasionally, an audible click was heard as the mandibles closed again. Otherwise the abdomen and/or thorax of the ant was sucked dry and the remains discarded. The gape of the mandibles of a tiger beetle larva is wider than the width of the head.

Feeding *"in situ"* in the burrows was found to have some special features in the conditions in which the larvae were kept — high temperature and humidity. The larva often remained about $\frac{1}{4}$ mm below the surface when "surfaced", instead of flush with the soil layer. When an ant was grasped in the mandibles the larva descended deeper into its burrow (and out of sight) for an interval of 1-5 minutes, rarely longer. On reascending the burrow, the larvae usually still bore the remains of the ant in its mandibles. In such cases the corpse of the ant was often flicked an inch or more away from the burrow entrance, by a sudden extension-flexion movement of the head and thorax of the larva. This catapulting of the old corpse away from the burrow was occasionally accompanied by the grasping of a second straying ant in a single coordinated movement.

Conclusion: These observations on individual larvae indicates interesting behaviour in *Cicindela* larvae. Further work could include preparation of "time charts", showing the time a larva spends at the bottom and at the top of its burrow. A larva could be induced to burrow between two glass plates to observe movement, feeding and the life history of the larva more closely. Some fairly simple work could involve observation of species of prey taken, in captivity and also possibly in nature. Finally, population density measurements could be made and correlated with relative abundance of different species of prey in randomly selected areas.

Martin Henderson

HYLES (CELERIO) TITHYMALI

In 1975 a new dealer appeared on the scene; a Mr. R. Adams from the Canary islands who was offering such goodies as *Acherontia atropos* L., *Herse convolvuli* L., *Hippotion celerio* L. and *H. tithymali* livestock, the last being particularly interesting. With trembling hands I made out my cheque and order for 10 *tithymali* pupae, popped it in the post and waited. They arrived within two weeks, packed to withstand an atomic blast which made unpacking a bit of a problem. After all had been found they were put in a clean plastic container and placed upon a shelf in the bedroom, much to the household's horror.

Many people believe that this animal is but an extreme sub-species of *Hyles euphorbiae* L., but others, me included, think it may be a distinct species in its own right, for reasons which will become apparent later.

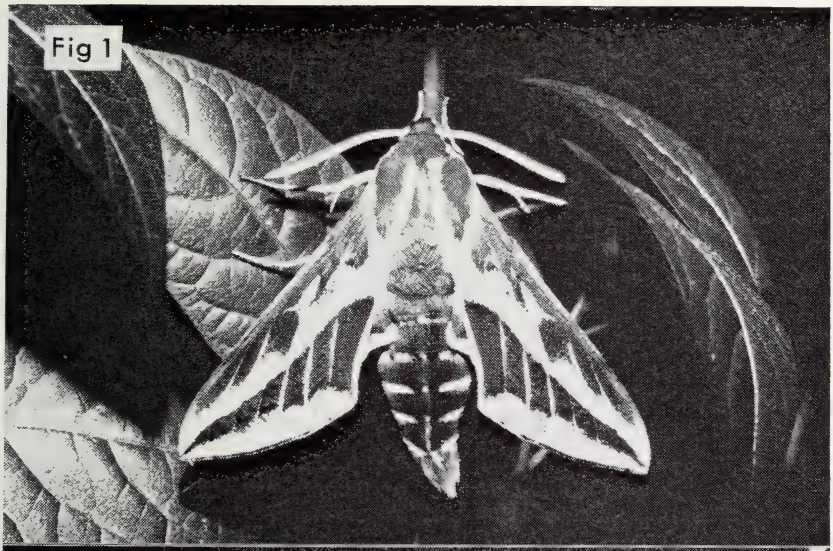
In the wild it is confined to the Canary islands being found all over them, but occurring most commonly in the drier and warmer parts, such as the steep sided valleys and flat southern areas. Being continuously brooded, ova, as well as larvae, in all their stages, can be found at the same time on the *Euphorbia mauretanica* shrubs; the former in clusters on the growing tips where the females had laid them while hovering, and the latter all over the plants, stuffiing vast quantities of leaves down their gullets between basking in the hot sun. Both these latter factors contribute, no doubt, to the larvae feeding up in 25 to 30 days.

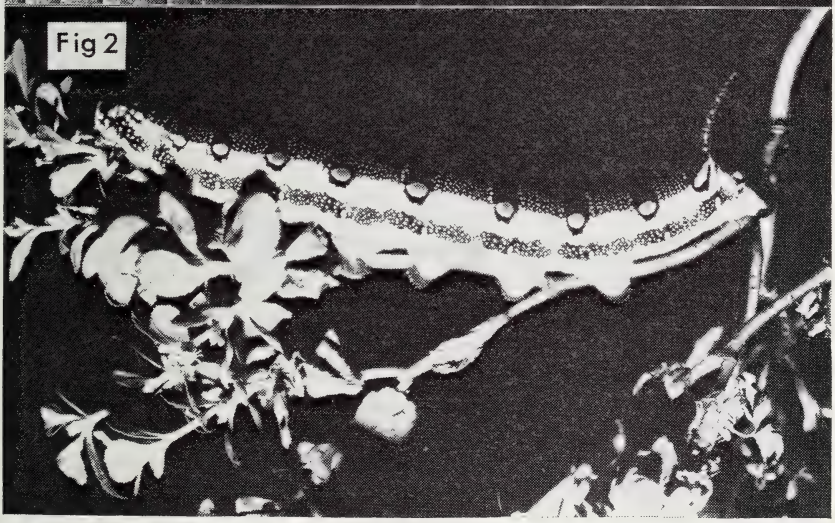
Having given the blurb on its native habits I now return to my pupae which were starting to form up. The first two were left in the plastic box until one day before emergence, but this resulted in both adults having under-developed thoraces. I concluded that this may have been due to keeping them in the box, so the rest were promptly placed on clean, dry sand in a tray on the bedroom table, where they emerged successfully. Only one pair, however, emerged close enough together to contemplate breeding.

Along with most other moths which feed, this species hatches with unripened ova in the abdomen, so feeding is essential if ova or even pairing are possible. Having had much experience with *euphorbiae*, I realised that these would not feed from flowers provided in their small pairing cage (a 38 cm cylinder only 35 cm high!), so force feeding on sugar-water, enriched with a fragment of vitamin pill, was the order of the day.

This was done once every 24 hours and on the fourth night I was rewarded by a pairing. Although I did not observe it, I knew it had taken place, as on the next three nights an average of 60 ova were laid. Unfertilised females did not lay any ova.

No flowers or foodplant were included in the cage, the females





laying their near spherical, blue-green, very turgid eggs in small clusters on the netting while clinging to it and beating their wings very rapidly.

Before going on to describe the larval stages the coloration of the imago deserves a mention. Fig. 1 depicts a male. The central pale area on the forewing is silvery white and does not extend to the edge of the wings, while the sub-marginal area is grey and not a buff brown as in *euphorbiae*. The abdomen also shows a difference in that the hair-like scales bordering each segment show a chequered pattern. Females are similar but tend to be larger, have broader wings and the central area

of the forewing is usually creamy-white. Apparent in the photograph is silvery venation which occurs only in some specimens.

The eggs form up very rapidly spewing forth little black monsters after only about 7 or 8 days. As I had very little spurge at hand, I placed three outside on a priceless clump of central asian poinsettia *(Euphorbia wallichi),* which graces a corner of the parden, and left them to their own devices, the rest I sleeved on dock and that abominable thing known as the Japanese knotweed *(Polygonum cuspidatum),* which contrary to its name was introduced from Central Asia. On all three plants, the larvae fed up rapidly in last summers record breaking heatwave, pupating 35 to 40 days later beneath a mixture of hay and dead leaves.

A few interesting points I did find out were that it is impossible to interchange foodplants, although from one species of spurge to another is just possible, and to try and raise larvae in enclosed containers indoors is suicidal, as I found to my cost when a few I was feeding up on willow-herb *(Epilobium),* perished in their 2nd instar of wilt disease.

As already mentioned, the larval colour on hatching is black, which changes to the final pattern during the 2nd instar, although it is brightest in the final stage (Fig. 2). The ventral surface and the pale lateral stripe are greenish-yellow, the same colour speckling the grey bands. Head, horn, prolegs are coral red, as is a narrow dorsal band joining the first two. The eye-spots have a red centre surrounded by a pale ring, both being placed in a sooty-black oval, while the spiracles are white.

It can be gleaned from the above that both larval and adult colouration are different from *H. euphorbiae* and this, in conjunction with the fact that hybrid ova only have a 20% hatch success, lends weight to *tithymali* being a separate species. Unfortunately the hybrid larvae were not reared so it could not be ascertained whether the F.1. generation is infertile as for instance in the *populi*×*ocellata* cross.

Before closing I would just like to mention the various defensive mechanisms exhibited by *tithymali* larvae. Spurge has a very alkaline sap which makes anything feeding on it unpalatable, but an inexperienced predator would first have to kill a larva to find this out, after which the warning colouration would be a sufficient deterrant. This would though still result in many larvae being killed were it not for a further mechanism demonstrated by the two remaining fully grown beasties decimating my prize *wallichi,* the other having been scoffed by a colourblind spider whose tastebuds weren't in order.

One of the larvae was basking fully exposed in the hot sunshine when it was spied by a beady eyed feathered rat (alias housesparrow). Down it zoomed on its prospective meal, landing a few inches away. Two hops and it was upon its victim, only to receive a nasty shock at the first peck, for the morsel suddenly came to life, spewing forth the contents

of its gut, achieving a bullseye, or should I say sparrows-eye. The bird leapt sidewards and after scraping its head in some sand disappeared over the horizon never to be seen again. Although that caterpillar survived that encounter it later succumbed to the attentions of a parasitic dipteran. Ah well you can't win 'em all.

A. R. Pittaway (4802)

BOOK REVIEWS

A DICTIONARY OF ENTOMOLOGY, by A. W. Leftwich, B.Sc., F.Z.S., M.I.Biol. Constable, London. pp 360. 1976. Price £6.50.

On no account buy this book. Written evidently by a non-entomologist, it is out of date in its nomenclature and system of classification and is riddled through and through with inaccuracy, Most of what you have the right to expect in a dictionary of entomology is absent.

The entries fall into two categories. First there are the definitions of entomological terms. These are, for the most part, accurate and clearly expressed, but my criticism here is that so much is omitted. The book is "primarily intended for amateur entomologists". I am one. I might need the help of a dictionary over the technical terms used to describe genitalia or wing-patterns. Of the 63 terms given by Peter Cribb in the glossary of *An Amateur's Guide to the Study of the Genitalia of Lepidoptera* (AES Leaflet No. 34), only 14 are defined in the *Dictionary* and these are ones you would not normally need to look up. Terms used in the description of wing-patterns, such as the orbicular or reniform stigma, are likewise omitted.

The real trouble, however, comes in the description of "nearly 3000 species of insect", for here the author reveals complete ignorance of his subject. I am a lepidopterist as are most of those who will read this review; I shall therefore confine my comments to the Lepidoptera.

I started by looking up Nepticulidae. I found, not the family, but the genus:—

"NEPTICULA. A genus of small moths of the family Tineidae whose larvae are leaf-miners in oak, beech and other trees." The Nepticulidae are a family in their own right and do not belong to the Tineoidea. In fact, the Nepticuloidea and Tineoidea belong to different suborders, the former to Monotrysia and the latter to Ditrysia. In passing let me say that a quarter of our species of Nepticulidae do not mine the leaves of trees.

I looked up Monotrysia. I read:—

"MONOTRYSIA. An alternative name for Hononeura, i.e. moths having almost identical venation in the two pairs of wings and having reduced identical venation in the two pairs of wings and having reduced mouth-parts." But this is *dreadful*! The term Monotrysia refers to the single genital opening on the female abdomen and has nothing what-

ever to do with wing-venation or mouths. The definition is untrue, for Homoneura are found in the suborders Zeugloptera and Dacnonympha as well as Monotrysia and majority of Monotrysia are not Homoneura. The Micropterigidae belong to Homoneura, but manage to eat pollen very well with their "reduced mouth-parts". If you turn to his contrastingly accurate entry under HOMONEURA you will find that Mr. Leftwich had the facts available to him but neglected to make his entries mutually consistent. Ditrysia is not defined in the *Dictionary* — perhaps fortunately.

Before leaving the Nepticulidae, I looked up *Stigmella,* where I found: —

"STIGMELLA. *Stigmella microtheriella,* the smallest known European moth..." A reference to the current edition of *The Guiness Book of Records* would have avoided that mistake, though the heresy may live on in *The Guinness Book of Animal Facts and Feats* which features in the author's Bibliography. Note the unsatisfactory method of defining a genus, and elsewhere even a family, merely by reference to one of its species.

Next I looked up Tineidae. In a partly accurate entry I was told that the moths had long palps, which is incorrect, and that the larvae of many of the species which are not clothes-moths are "shoot-borers and leaf-miners". I know of none which feed in that manner. No mention is made of birds'-nests, fungi, lichens and rotten wood which are the real pabula of the family.

The next entry I looked at was: —

"LYONETIIDAE. Long-horned Leaf-miners..." Nonsense again: they are not long-horned like the Adelinae; and why the upper case for "Leaf-miners"? "...sometimes brightly coloured..." Not in any British species. "The larvae bore tunnels in leaves of deciduous trees." What about those species of *Leucoptera, Bedellia* and *Bucculatrix* which feed on low plants and, in the last genus, mine only when young? "*Lyonetia speculella* bores into apple leaves; *Lyonetia clerkella* attacks birch trees." Birch is a secondary foodplant of *L. clerkella,* attacked by probably less than 5% of the population. The principal food-plants are rosaceous trees, with apple one of the most popular. *L. speculella* is not a British insect but we are not told what part of the world it hales from; this important information is withheld in numerous oher instances.

I turned to *Coleophora*: —

"COLEOPHORIDAE. Case-bearers... The caterpillars, which are pests of larch and other trees, construct portable cigar-shaped cases of silk and leaf particles." *Coleophora laricella* (Hübner) is a ubiquitous insect but of no significance as a pest; it is not even mentioned by C. R. Baker in his chapter on "Pest Species' in *The Moths and Butterflies of Great Britain and Ireland.* Nor are any of its relatives pests in Britain. *Coleophora* cases have many more shapes and materials than the

author is aware of and the larvae of the various species are by no means confined to the foliage of trees.

So far I have been considering microlepidoptera, so I turned hopefully to the macrolepidoptera to see if the situation was any better. I started with the biggest moths:—

"ACHERONTIA. Genus of the Death's Head Hawk-moth... The colour is black and brown with a skull-like marking on the back of the thorax." Are your *atropos* "black and brown"? Mine are not. And what a paltry description, anyway!

"PINEHAWK-MOTH... a rare visitor to Britain". It is a resident breeding species.

"PRIVET HAWK-MOTH... The caterpillars... are bright green with oblique reddish brown and white lines". The man is colour-blind!

"GARDEN TIGER MOTH... The hind-wings are scarlet with dark brown spots." Colour-blind again!

You will notice that entries are made under the English or scientific name of the species according to the whim of the author.

I next selected two pages (pp. 110-111) for analysis. One error had already caught my eye, but apart from that I had no idea what was in store. The pages include descriptions of seven species of Lepidoptera. Two are accurate though superficial. The other five involve at least ten mistakes.

"GREEN LONGHORN MOTH. *Adela viridella"; viridella* Scopoli, 1763 is a junior synonym of *reamurella* Linnaeus, 1758. "... wings bordered with black"; untrue. "... The larvae are leaf-miners"; untrue. "... When the leaves drop to the ground the larvae make portable cases of the fragments of dead leaf and feed on these from the inside." The larvae drop on hatching, long before the leaves do, and how silly to go to the trouble of making a portable case only to eat it! But it is Mr. Leftwich who is silly, not the larvae.

"GREEN OAK MOTH. *Tortrix viridana*... The moth is about 12 mm. long"; moths are measured by their wingspan (in this instance 17-24 mm.) and not by their length — a convention observed by the author in other contexts. "... The larvae are green with a black head"; do they share a head like the reverse of a Hydra?

"GREEN VEINED WHITE". The lack of the hyphen makes nonsense of the name, since" green" must then qualify "white", compare "man eating tiger".

"GREY SHOULDER KNOT. *Grapholitha ornitopus."* The correct genus is *Lithophane* and the junior synonym should be spelt *Graptolitha.* "... closely related to the Mexican moth *Grapholitha saltitans* whose larvae feed in 'jumping beans'." A noctuid closely related to a tortricid! ! Clearly Mr. Leftwich knows nothing but the names of these moths and when he gets the names muddled he makes a fool of himself. Are you still thinking of buying the book? Incidentally, the

correct name of the jumping bean moth is *Cydia saltitans* and the correct spelling of the genus in which it was formerly placed is *Grapholita.*

"GRIPOSIA. The *Merveille du Jour (Griposia aprilina).*" The correct generic name is *Dichonia.*

And so it goes on, blunder upon blunder, horror upon horror. Space permits me to mention only a selection of the enormities I have noticed. I am a charitable man and prefer to praise than to blame. Fearing that I might be too stringent in my judgement, I checked it against that of a first-year "A" level Biology pupil who is interested in entomology. I passed the book to him without comment, via his Biology master, with a request for his opinion. The next day the boy rang up. "What am I meant to say about this book?" he asked, feeling his way cautiously. "I want your candid opinion about its merits and defects." "Then I think it is a dreadful book", and he embarked upon a tirade against its sins of commission and omission. Some of my friend's comments are incorporated in this review; I am not alone in my strictures.

When the scientific name of an insect is given, the author's name is omitted; this involves the user of the *Dictionary* in the tedious task of consulting a second book of reference. The lower case is used for the names of plants and animals except when the author is careless, as in "Bladder Campion" on p. 114 or "Mountain Avens" on p. 239; however, the upper case is used for the names of insects. This is a strange inconsistency but may be attributable to the natural tendency to use the upper case for things which are unfamiliar.

There are few misprints, though *Eriocrania sparrmannella* is misspelt on page 77 and *Parornix aglicella* on p. 218 should surely be *P. anglicella* (Stainton). Incidentally none of the British species of *Parornix* can be described, as the author does, as "usually attacking strawberry leaves"; *P. anglicella* alone does so very, very occasionally.

Let me revert to classification. I have already drawn attention to the clear and accurate entry under HOMONEURA; there the author expressly states that the system of classification based on wing-venation alone has been superseded. Yet when we look at his appendix on classification we find him using the obsolete system. He also gives a list of the "principal families" of moths, an arbitrary selection of about one-third of the British total which excludes some of the most populous. These he arranges in alphabetical instead systematic order, thereby depriving his list of all scientific value.

One wonders who can make use of a book of this nature, for the many errors rob the considerable number of accurate entries of their credibility. Possibly a third-rate Biology student could embellish his essays with quotations from its pages, provided his teacher was equally uncritical. Let us hope that such combinations are rare.

The printing and binding are a credit to the publishers; the text is not. Their reputation would best be served by the withdrawal of this unscholarly book from circulation.

Tailpiece. The following extract contains nine errors or misleading statements; how many can you detect?

"PRAYS. *Prays curtisellus* and related species: small moths of the family Tineidae having white fore-wings and dark brown hind-wings; the caterpillars are yellowish, turning green. In the early stages they mine into ash leaves but when they become too large for this they bore into the terminal buds, doing much damage to the trees."

A. M. Emmet (1379)

THE INSECTS AND PLANTS OF PORTSDOWN by D. Appleton, M. Bryant, R. Dickson and G. Else. pp. 90. Published by The Fareham Entomological Group c/o Flagstones, Catisfield, Fareham, Hants. Price 53p incl. p. & p.

Hampshire is fast becoming the county with the most up-to-date recordings of its insects. We have already had B. Goater's comprehensive survey of the Lepidoptera of the whole county and the Fareham Entomological Group's previous publications on selected areas within the County which to date have covered Upper Titchfield Haven, Oxenbourne Down, Curbridge and more recently the Forest of Bere (1975). This most recent publication is in the same format as its companions, i.e. duplicated on 4to. with stiff paper cover and glued back. There is a general foreword by George Else. The Lepidoptera have been dealt with by Richard Dickson, the Coleoptera by David Appleton, Hymenoptera, Diptera and other orders by George Else and the Flora by M. Bryant. In addition to recording the existence of species there are interesting notes on many of the more unusual occurrences. All these publications will be welcomed by those interested in the ecology of the County and should give an impetus to others to record what they see. One hopes that similar groups in other counties will be encouraged to start a similar project. One must congratulate the team on the care and effort which has been put into this useful series.

PWC.

THE PUBLICATIONS OF THE FAREHAM ENTOMOLOGICAL GROUP

The Upper Titchfield Haven, a provisional list of the Beetles, Butterflies and Moths with notes on the Fungi and crickets; 1971. Fifteen pages. *Out of print.*

The Insects of Oxenbourne Down — a provisional survey; 1973. 172 pages. *Almost out of print.* 50p+30p post and packing.

The Insects of Curbridge — a provisional survey; 1975. This is a brief

report on the H & IOWNT reserve. 30 pages. 10p+10p post and packing.

The Insects of The Forest of Bere; 1975. An extensive report on the woods comprizing the Forest of Bere, especially Botley Wood, West Walk, Wickham Common. 187 pages. 85p+30p post and packing.

In preparation are reports on the Alver estuary and adjacent coast (Gilkicker Point, Browndown range. Cherque reserve, the Wild Grounds) and one on the Titchfield Haven (combined upper and lower Havens), and a revision of the Oxenbourne survey to include a flora. The Alver report may be published as soon as a year after Portsdown and Titchfield Haven one year later; Oxenbourne may appear early in 1980, but the authors are unable to commit themselves to exact dates yet.

In addition there are certain publications that are duplicated to requirements. Up to now these have been the annual records of the Lepidoptera, supplied to those expressing an interest or concern, and edited by R.J.D.; and reports on the Coleoptera of Alresford Pond reserve and Harewood Forest by D.A. (the latter containing notes on the Lepidopter and Aculeate Hymenoptera). These have been produced only to immediate demand and cannot be supplied, but interested parties should let the authors know so that they may receive future productions of this sort.

LADYBIRD BEETLES (COCCINELLIDAE)

The scientific name is a good descriptive term, for it comes from the Greek word meaning "scarlet", and refers to the colour of many of the adults. Although many ladybirds are bright red or yellow, decorated with spots or lines of black, almost as many are exactly the reverse in colouring. These are black, spotted with red or yellow.

Descriptive:

Two-spotted ladybird, *Adalia bipunctata* (L.), is a small, arched, red species with a black spot in the centre of each wing cover.

Nine-spotted ladybird, *Coccinella novemnotata* (L.) is one of our larger species. Hemispherical and nearly round, it has four black spots on its bright-red wing covers.

Ceratamegilla fuscilabris (L.) a pretty, rather flat, red lady beetle with six black spots on each wing cover.

The genus *Hippodamia* has a number of common species, widely distributed in North America. They are generally more oval and less hemispherical than some of the other species.

Hippodamia convergens (L.) is named from the two converging lines on the thorax.

Hippodamia parenthesis (L.) is named for the comma-like marks on its wing covers.

Hippodamia tredecimpunctata (L.) is named for its thirteen spots.

The twice-stabbed lady beetle, *Chilocorus bivulnerus* (L.) is one of our largest and most brilliant species. It is shiny black, with two rather small red spots, one in the centre of each wing cover.

Rearing:

Ladybirds which feed on aphids attached to plants are best kept in a plant propagator so that the food source does not die so quickly. So go into your garden and find a plant which is being attacked by aphids. If it is a large plant then transfer some of the aphids to a potted plant and put into the propagator. There will probably not be sufficient aphids for your ladybirds so let the aphids multiply for a day or so before introducing the ladybirds. The plant the aphids and ladybirds are on will need regular watering. The ladybirds which feed on plants can be kept in a similar propagator with a plant but no aphids.

Peter A. Stratton (5474 J)

NORTH FRANCE—AUGUST 1975

Having acquired a motor caravan, we decided to take a family holiday on the continent, a trip to combine sight-seeing, fishing and some bug-hunting. 'We' consisted of myself and my wife, my son Stephen, well known to those who come to our annual exhibition, and my daughter Catherine. We drove early on the 29th July to Ramsgate via Canterbury and then on to the Hovercraft. This had appeared in a cloud of spray from the depths of the Channel like something out of a Jules Verne novel and slid up the sandy shore. With us on board was a huge coach and a large number of cars. We crossed the Channel at a speed of 65 mph. and in 30 minutes were already passing into the customs at Calais. We camped our first night in a wood south of St. Omer where in the evening sunshine we found the grasses dotted with roosting Small Skippers, *Thymelicus sylvestris* Poda, Gatekeepers, *Pyronia tithonus* L., and the odd Marbled White, *Melanargia galathea* L. The last time I encountered this butterfly in woodland was in Abbotts Wood, Sussex where it used to be quite common in woodland rides. We then continued our journey south to Rouen. The impact of the E.E.C. agricultural policies have certainly changed the face of northern France. My last journey along these straight tree lined roads had been through a mixed agriculture interspersed with open downland and wild areas. Today it is one vast land of arable farming and only the forests and woodlands and the steep escarpment remain unploughed. The main crops are wheat and maize with some flax, poppy, sunflower and lucerne. The latter is one of the important foodplants of the Clouded Yellow, *Colias crocea* Geoff., but today it is being harvested several times in the season in a green state and silaged or processed at drying stations. This will mean that the Clouded Yellow will have little chance to build up its numbers in North France and I anticipate that there will be no more 'crocea years' as we used to

expect every so often. In our fortnight and three days in north France we did not see one specimen of this butterfly although this is the peak period of emergence and the time when I used to observe the mass migrations of former years. We drove through what was a desert, as far as the lepidopterist was concerned, through a vast plain of wheat dominated by new cathedrals to the Goddess Ceres, granaries and drying plants. At Rouen, where we visited the Cathedral and the abbey church of St. Ouen, we camped facing a steep slope above a chalk pit. On the slopes were a few *Leptidea sinapis* L., the fragile Wood White, and the Chalkhill Blue, *Lysandra coridon* Poda. There were also some second brood Small Blues, *Cupido minimus* Fuessl. and a lot of Marbled Whites. The weather was extremely hot with mid-day temperatures of 90°F in the shade and working these slopes was very hard work. Our next move was via Beauvais and the valley of the Aisne to Le Chesne in the Ardennes. Here we camped beside a large lake, Lac Bairon. This is a beautiful setting although the camp was a bit short on the hygiene. The lake is a favourite spot for fishing, being full of large roach. The reed beds were alive with brilliant Dragonflies and I counted five different species of watersnail among the weeds through which we waded to go swimming. We were able to watch two adult and two young Osprey fishing over the lake and a Hobby which was hawking after the dragonflies, like a huge swallow. There was a clump of Stinging nettles on the edge of the lake and here I caught the summer form of the Map Butterfly, *Araschina levana* L. and saw a lot more. It is a very fast flying insect and easily overlooked. I saw one Swallowtail, *Papilio machaon* L., flying along the edge of the lake and there were some Common blues in the adjoining meadow, *Polyommatus icarus* Rott. The three Whites were the only common species on the wing and we met them everywhere during our stay, their activities appearing to be of a migratory nature. Having fished and swum we decided to try the Forest areas near Soissons and camped in the Forest of Retz. As we arrived in the forest a female Purple emperor, *Apatura iris* L. settled on the white surface of the van and I saw two others flying along the glade during the day. The laying area appeared to be a huge thicket of Sallows *Salix caprea*, on the edge of a clearing in the Forest but a sea of brambles and nettles made investigation very difficult. The Wood white was common here and there were hundreds of Gatekeepers. A surprise was a female White-letter hairstreak, *Strymonidia w-album* Knock, which was flying along the glade. There were quite a few Common elm, *Ulmus campestris*, growing along the roadside and I assumed that this was where it had come from. The elms already showed signs of Dutch elm disease which seems quite widespread in France also. We saw no Fritillaries at all in this area which was a surprise. While we were here we visited the Castle of Pierrefonds which was rebuilt by Napoleon III. It is a magnificent building with some fine wood and stone carvings.

We then went south east into the Department of Aube to the village of

Bar sur Aube where we camped beside the river. Despite the close proximity of the local sewage works, this was a very pleasant spot. The swimming is excellent and there were some big Chub in the river. They did not respond to conventional baits so I captured a few Grasshoppers on the slopes outside the town and with one of these, fished below the weir, I was able to land a fine 3lb. specimen which our French neighbour was delighted to receive for his dinner. The area around this village was the only really interesting entomological area I found on the trip. To the east there were rough slopes above corn fields, dotted with young Pine trees. Here there were hundreds of Chalkhill blues. It was so hot that they were settled on the ground in the shade of the Pines and as I walked among them rose in clouds. I netted a lot of them and at last was rewarded by a female ab. *syngrapha*. Among them there were also a lot of *Colias australis* Verity, seeking the shade, the majority being males and all very fresh. Along the edge of the roadway I found another species, *Lycaeides agyrognomon* Berg., which is very like the Silver-studded blue, *Plebejus argus* L., and *L. idas* L. The females were very beautiful, being heavily suffused with blue. I also saw several Lulworth skippers, *T. actaeon* Bott., and the Wood white was fairly common. On the other side of the village I found a rough slope below a wood which was rich in butterflies also. The species included a surprise, the Scotch argus, *Erebia aethiops* L. It is always a wonder to me that this butterfly should occur at such low altitudes and in such hot and arid conditions in France and Switzerland, while in England and Scotland it is only a northern butterfly of damp and not too sunny habitats. One wonders why its range here is so limited. Here I also took the Weavers fritillary, *Clossiana dia* L., *Lysandra bellargus* Rott., and the Mazarine blue, *Cyaniris semiargus* Rott. In a small bush on the slope I found a nest of the Cirl bunting which still had its scribble-marked eggs unhatched. There were a few Purple hairstreaks, *Quercusia quercus* L., flying around the scrub Oaks on the slope and some second brood Holly blues, *Celastrina argiolus* L. This area showed what the potential of the area was but the invading wheat fields come right up to the village and the village street was strewn with wheat from the passing trucks carrying it to the granaries.

We left Bar and drove towards Troyes. At a roadside stop I found the Chalkhill blue again common on rough ground by the road and added one new species, a male *Arethusana arethusa* Schiff. The rest of our trip during which we visited the town of Moret sur Loigne, whose church was consecrated by our Thomas à Becket, and Chartres had little of entomological interest. The pattern of arable land followed us all the way back to the Somme where near St. Omer we had some success catching large bream in one of the multitude of canals which criss-cross the area. Here I again saw the Swallowtail flying along the water's edge. On the seventeenth day we arrived back at Calais where the camp-site was full and we spent our last night in the car park above the beach. I was left with the

reflection that conservation of some habitat is essential if agricultural changes are not to destroy the greater part of our insect fauna—this is now appreciated in Great Britain but in France there appeared to be little attempt to save any such areas in the north. We must be thankful for those beautiful mountains of the east and south which still make France one of the most exciting countries to the lepidopterist.

P. W. Cribb (2270)

NOTES AND OBSERVATIONS

DINER'S DELICACY:—Recently I came across Vincent Holt's delightful book entitled 'Why not Eat Insects', which first came into print in 1885. In its various chapters the author tries to persuade the public to take up eating these creatures, and backs this up with steadfast arguments. I shall just pick out a menu in the back of this book and you shall see whether your 'prejudices', as the author calls it, shall make you turn up your noses at these mouthwatering dishes.

Curried Cockchafers
Wasp Grubs fried in the comb
Moth sautes in butter
New Carrots with Wireworm sauce
Gooseberry cream with sawflies
Stag beetle larvae on toast

A few weeks after buying this book I decided to try one of these recipes out; so I planned on having Fried grasshoppers. I obtained five of these and put them into boiling water where they changed to a pleasant reddish colour. Then after getting a frying pan, and having placed a small chunk of fat in it, I removed the hind legs and wings of my grasshoppers and put them into the frying pan, one by one. Then I set out to devour them, and found them quite crispy, but they tasted, well, not exactly agreeable. Perhaps because I had burnt them! — J. Good (5398 J)

LIECHTENSTEIN RHOPALOCERA:—A SMALL CORRECTION:—In Mr. Goslings article in November last issue, the Editor regrets that a generic error crept in. At the bottom of page 150, for *Euphydryas*, substitute *Erebia*.

HELP WANTED:—For work on Noctuidae immigrant to the British Isles I should be most grateful for any unpublished accounts of the finding of *wild* larvae or pupae, with dates and later history if possible, of the following species: *A. ipsilon, P. saucia, E. occulta, M. albipuncta, M. vitellina, M. unipuncta, P. meticulosa, Spodoptera littoralis, Caradrina exigua, Trichoplusia ni*, and of any of the scarcer immigrant species.—R. F. Bretherton, Folly Hill, Birtley Green, Bramley, Guildford, Surrey GU5 0LE.

LATE PIERID LARVAE: — On 20th December 1975 I found a full grown larva of *Pieris rapae* L. (small white) feeding on Cabbage *(Brassica oleracea)* in my garden in York. After bringing it indoors, it suspended itself on the cage side and pupated on Christmas Day. Due to the unusually warm summer and the mild winter to date, in this part of the country, with only two or three mild frosts, this would account for the late survival. — A. J. Gillery (3653)

A NOTE ON THE 7-SPOT LADYBIRD: — During the summer of 1975 it was noticeable that ladybirds were extremely plentiful; obviously due to the thriving number of aphids. During the earlier part of the summer I collected some ova of *Coccinella septempunctata* L., and managed to rear them right through their metamorphosis to the imago stage. This early bred generation, I noticed, had a more orangey pigment to their elytra than the parent generation. I noticed also that wild specimens were the same colour as my bred ones. I wonder, is this characteristic to the summer generation each year, or is it just a mere coincidence? — J. Good (5398 J)

MASS HIBERNATION OF SMALL TORTOISESHELL BUTTERFIES IN EAST KIRKCUDBRIGHT: —With references to Dr. C. B. Williams' most interesting article (A.E.S. Bulletin 34:160) on the mass hibernation of this butterfly on the North shores of the Solway Firth, I find this most interesting as I have never heard of so many as around fifty of this species spending the Winter together in hibernation anywhere in the British Isles. I have known for many years that the Small tortoiseshell butterfly is well established in the Lowlands, much more so than in Merioneth where I live.

As a further reason to those given by Dr. Williams, with which I agree, for the presence of so many butterflies in the garage at Kirkbean I am wondering if there are any plants of the cultivated Sedum nearby as the flowers of this plant have an irresistible attraction for *V. urticae* L. This attraction I have noticed for years, when and where the insect is abundant in August and September. In these circumstances it is quite usual for one small plant to have as many Small tortoiseshells feeding happily on the flowers as there are room for, to the exclusion of other species. It is very significant too that the site chosen for the mass hibernation was a garage, as this would probably be open all day for the uninterrupted entry of the butterflies to take up position for hibernation on the armchairs, which would further help to make up the half-century figure.

The Small tortoiseshell likes buildings (often inhabited) and churches for hibernation. The Peacock butterfly nearly always takes up position for the Winter in holes in trees. The Comma butterfly prefers to hiber-

nate unprotected in the open often on a tree trunk and is very rarely seen consequently, as the protective mimicry is so wonderful. It is a great joy to me that three so closely allied butterflies should be so different and fastidious about choosing sites for their Winter quarters. — P. N. Crow (393)

ABUNDANCE OF LADYBIRDS IN HAMPSHIRE 1975: — I have not seen, as yet, any reference to the abundance of ladybirds during the summer of 1975. I do not know if it was the case countrywide, but in the Winchester-Alresford area of Hampshire quite a few species have appeared in many more than average numbers. I am not a coleopterist but in addition to the common 2-spot, 7-spot and 22-spot species I have identified the 11-spot, a small species, smaller than the 2-spot which was very numerous in the garden. While removing beansticks in the autumn a number of this species were found hibernating in the knotted rope holding the sticks together. They were in closely packed groups of anything from 6 to 8 in each group. Indoors also I keep finding hibernating individuals, and due to the central heating quite active. These were in all probability, a common species but I have not noticed it before. A neighbour remarked to me on 26th July that while playing golf on the Alresford course he encountered "thousands" of ladybirds (of which species I do not know) but in sufficient numbers to draw the attention of the non-entomologist.

I would be very interested to know if other members noticed this abundance elsewhere. — B. R. STALLWOOD (1547)

BUTTERFLIES OUT OF SEASON: — Occasionally one may receive butterfly pupae from abroad which produce imagines very late or very early in the year when conditions outside are impossible for normal mating and ovapositing. Our member K. A. Harrison (4878) writes that he received pupae of *Papilio machaon* L. from Malta which produced imagines in November. He was able to obtain hand-pairings and writes "You may be interested to know how I persuaded the females to lay on a cold November day. I simply parked my car in the sun, stood the cage — a small one just covering a 6″ flowerpot — near the window of the car and it worked. The car acted like a greenhouse and the inside temperature was about 22°C to 24°C. I have found that a sunny window inside a centrally heated room can be just as effective. Another trick I have used is to partly enclose the cage in a polythene bag and adjust to obtain the same temperature as stated above. In such a case it is essential to use a small thermometer inside the bag on the shaded side. The ventilation is then adjusted to get the right temperature. With this method I obtained ova from the Duke of Burgundy fritillary, *H. lucina* L., when the outside temperature was only 10°C."

BUMBLEBEE DEATHS IN WALES: —My wife and I spent the last fortnight of May 1975 in Pembrokeshire. Except for a little overcast and rain on May 25th the weather was consistently good with bright sunshine every day. But there were generally a rather cool, strong, northerly wind. This admirably suited our aim of walking as much of the magnificent coastal path as our advancing years allowed.

We saw very few butterflies either on the cliffs or in more sheltered lanes, but there was a wealth of flowers. The following observation may interest some members and perhaps extract from one of them an alternative explanation to the one I offer for the sad death of so many Bumblebees.

Walking north from St. David's Head my wife, no entomologist, was in the lead. She turned back to draw my attention to a vast number of dead and dying Bumblebees which were scattered thickly over an area which proved to be only a few hundred square yards. This was at the extreme north flank of the St. David's Headland (Map Ref. 739289 on Ordnance Survey 1: 50000). There had been no sign of similar disaster until we reached this point which is the southern extremity of Cardigan Bay.

In such circumstances the mind naturally leaps to poison sprays. But this seemed improbable as there is no agricultural land anywhere near and it seemed unlikely that sprays would be used on a limited area of moorland.

I put five of the dead insects in a pill-box, all gathered from the spot where I was actually standing. On our return home, at the suggestion of a friend in the Hope Department, Oxford I sent my specimens to Professor O. W. Richards, the expert on Bumblebees. He kindly submitted my finds for testing at the Monk's Wood Experimental Station and in due course informed me that tests for about a dozen of the commoner kinds of toxic chemicals had been negative. He also informed me that the five specimens which I had submitted, all gathered in the space of about one square yard included three different species of Bee. He confessed that he could offer no explanation of what we had seen.

But acting on a suggestion of my wife, a bit more of an entomologist by now, I should like to advance the following theory, subject to any corrections of those better informed than I, who know nothing of this order of insects.

Remembering that the wind was strong, cold and from the north, I examined the map of Wales. From the point where the insects were found, to the north lies the whole expanse of Cardigan Bay. The next point of land is the Lleyn peninsula, about seventy miles away, or beyond that, Anglesey. I wonder whether the Bees in question, either on migration, or simply carried by the wind, had traversed the whole of Cardigan Bay and made their first landfall, exhausted, near St. David's Head. If this theory is correct many bees must have fallen by the wayside and could have been observed from a boat in the sea below.—R. J. Seacome.

A NOTE ON PRESERVING THE DRAGONFLIES OF THE FAMILY AESHNIDAE IN THE FIELD.—The blue and green colours which make these dragonflies so beautiful and conspicuous invariably darken to almost black if they are not dried in a vacuum or kept in liquid preservative. It is, of course, desirable to preserve specimens in as natural condition as possible which also aids in identification. I have found that if the abdomen is detached from a freshly killed specimen and soaked for twenty-four hours in ethyl acetate, when it dries the spots have become white in contrast to the brown and black ground colour. Thus the shapes of the spots are clearly visible and a good approximation to the natural colours can be seen at any time by re-immersing the abdomen in ethyl acetate. The head and thorax are best dried rapidly in air e.g. over a radiator and the abdomen can be re-affixed later when all parts are dry.

This method requires only ethyl acetate which most collectors will already have.—P. H. Williams (4965 J)

STRANGE EXPERIENCE WITH *LASIOCAMPA QUERCUS* L.—I recently had some pupae of this species, though all were males except one, which was an extremely large female. (From stock brought back from Ireland in 1974.)

These emerged at odd intervals until the last female, I put in a small box in the fridge to keep cool. I left her there for some *three weeks*, and noted that she had laid about two dozen infertile ova, so gave up hope. However, my final eggar pupa emerged, a male, so I put my 'fridged' female, and fresh male in a large net cage, and then went on holiday for a week. On returning there were dozens of ova around as expected, but I KNEW they would be infertile, so shoved them in a small plastic box, and again went for a further few days holiday down south.

On returning, imagine my surprise when I happened to look in the box and saw dozens of tiny eggar larvae in it! Sadly, this is not a happy-ever-after tale, for it had been a very hot few days with the temperature in the nineties, and most of the larvae were dead or almost dead. Only six were saved, and these too died shortly afterwards, but this does at least teach that one should never give up all hope of infertile ova, that is, until they have completely collapsed, etc. I for one would certainly not have given any hope to these ova being fertile, the female as has been stated, having laid quite a number of infertile ova beforehand, but I shall know better in future.—Wesley Caswell (3133)

SOME NOTES ON BRAZILIAN LEPIDOPTERA

Papilio protesilaus L.

The habitat of this very elegant sword-tailed papilio is generally considered to be South, South-East and Central Brazil, where its popular name is "Vidrodoar", or "Aerial glass".

Its semi-transparent wings, with their 3-inch spread, are nearly-white, with a faint touch of yellow. Each triangular forewing is set off handsomely by six black stripes of various lengths, and a black outer margin. Each hindwing, with a narrow black tail, one inch long and white edged, has its outer margin relieved by eight or nine small white lunar marks, and a tiny scarlet patch at the inner angle. The underside of each hind wing is patterned with a deep "V" formed by black stripes, the outer one being scarlet-bordered. These markings are visible through the wing. The apex of the "V" lies near the inner angle and the arms touch the coastal margin.

P. protesilaus is said to be very plentiful in Rio Grande do Sul, the most Southerly State of Brazil, where it is alleged to congregate in clusters numbering hundreds, on wet ground. I do not know that region, but however abundant this butterfly may be there, it is by no means common in most of the other parts of Brazil.

This papilio is prized not only for its beauty but also on account of its general scarcity; and it is difficult to capture, being very alert, even when busy sucking moisture on the ground.

I have never set eyes on any *protesilaus* in the Northern latitudes of Brazil, but believe specimens have been taken in Amazonia. All those I have come across were in the South-East and Central regions at altitudes ranging from 2,700 feet to 4,000 ft; and always in the initial stages of the dry season.

They appear usually in the late forenoon, emerging suddenly from heavy forest or dense bush, flying at tree-top level or higher—up to about 150 ft. From this height they spiral down rapidly towards an open space, to settle on a muddy or sandy stream side patch, in the sun.

Papilio bunichus, Boisd.

In Minas Gerais, the only State in which I have seen it, this papilio frequents the highlands at elevations from 2,500 ft. to 4,500 ft. I have come across it principally in the rugged regions in whose geological characteristics iron-ores or quartzites predominates. In such localities, with soil composed to a large extent of oxidised and weathered iron-ore and humus, the vegetation consists of twisted and stunted trees and scrub, various rock plants, ground orchids, tiny cacti and herbs. These plants grow freely between the outcrops of "Canga" and in the humus-filled voids of these ferruginous concretions. After a good wet season a large variety of flowers bloom in great profusion, and at such times, for an hour or so before and after mid-day, *P. bunichus* may be seen flitting swiftly and jerkily from bush to bush, hovering about the slim-leaved arnica and other flowering herbs and plants.

Papilio agavus, Drury and *Papilio lysithoces,* Godt. seem to like similar terrain and appear at about the same time and periods as *bunichus,* though they also frequent lower levels and well-wooded valleys. *P. bunichus* keeps to areas where herbs and shrub, stunted trees and scrub predominate.

The red lumar spots on the lower wings of *bunichus* are not as prominent as those of *agavus* or *lysithores*, and the white splashes over both wings are less pronounced, while the thin white borders on the hindwings of *bunichus* are absent on the others. Nevertheless, these three papilios, of similar shape and size ($2\frac{3}{8}$-inch spread), are hardly distinguishable, one from each other, when in flight, all being basically black and equipped with $\frac{3}{8}$-inch tails.

The flight of *P. bunichus* is "flickering" with abrupt changes in height and direction, sometimes loitering, then swift, usually from 5 to 20 feet above ground level. These characteristics of flight are shared by *agavus* and *lysithores*.

Of the three species, *P. bunichus* is the most uncommon, *agavus* the least.

Morpho achilles, L.

This beautiful Morpho is probably the most widely distributed of the Morphoidae. I have seen *M. achilles* in forests and woods in many parts of the South-East, North-East and North of Brazil. The colouring of *achilles* is perhaps just as pleasing to the eye as that of the dazzling *rhetenor* Cr., *menelaus* L., or *cypris* Ww.—to mention only a few of this family of tropical butterflies.

M. achilles has an irridescent light blue band extending from near the costal nervure of the forewing, almost to the lowest edge of the hindwing, on a general background of black. The outer limit of this band is fairly well defined, but on the side nearest the body the irridescence merges into darker shades before turning black. The extent of the light blue area varies in different regions. I have found it to be less in the South-East than in the North-East; while in the North, in *M. achilas amazonicus* Fruhst., the irridescent band is considerably narrower, and its limits are more sharply defined, with no gradual merging of shades into black. However, in the rarer *M. achilles violaceous* Fruhst. found in the South-East, the irridescent blue is substituted by violet or mauve, just as brilliant, apart from which, this subspecies is generally similar to the other achilles mentioned.

In all these *achilles* there is, on the forewing, a small white patch on the costal border, some 3.5 cm from the apex. (The total wing spread is 11 cm). Accompanying the outer margin there are seven or eight white dots, while on the indented margin itself there is a tiny white mark at each indentation. On the lower wing each indentation has a pair of white dots; and there are five or six tiny red spots parallel to, and near the edge of the outer margin.

The pattern of the underside, which has a dark brown background, consists of thin whitish streaks and marks, three small circular ocelar spots on the forewing and four larger ones on the hindwing. All the species and subspecies mentioned fly near the borders of woods and forest and along the courses of shady streams. They also appear suddenly in a forest pathway, disturbed no doubt, when at rest or sucking the fermenting

juices of fallen fruit. Wherever possible, they seek mossy, fern-overhung banks. Their flight is low, erratic and fairly rapid; and when seriously alarmed they seek the denser parts of the jungle.

Xylophanes tersa, L.

This graceful, shapely sphinx moth is common in Brazil. I have seen many, ranging from the State of Sao Paulo in the south to the territory of Amapa in the north.

They are strongly attracted by light,—more so I think, than most Sphingidae. Even the dim lights of small interior towns and villages attract them, and about two or three hours after sunset, some may be seen circling the lamps. This they do so for an hour or so before settling on the nearest walls in the illuminated area, to sleep.

During heavy storms, when the sky is split by lightning, just before the rain bursts through in a heavy downpour, is when *X tersa* is most often to be seen near the lamps and on the whitewashed walls of sheltered verandahs. I once found one of these moths on an 18th floor office window in Rio on the morning after a severe rainstorm—one of the worst ever experienced in Rio. Also—during good weather, however,—I have seen one or two, on various occasions, on the white-painted sides of ships' decks, near the deck lights, with other moths, asleep—near the coasts of Sao Paulo, Rio, Bahia and Para.

X. tersa can be found too, hovering about many sorts of flowers—especially alamanda, "jasmine-manga" (*Plumeria* ssp.) and the blossoms of the "pitanga" myrtle (*Eugenia michelii*).

The larvae of *X. tersa* feed on the coffee plant and on "genipapo", and other plants of the Rubiaceae family.

Mechanitis lysimnia, Fabr. and M. polymnia, L.

Both these Ithomiids are of similar size and delicate shape with longer slender abdomens. In appearance they, and many other Ithomiids look the same in flight, but when examined, all have different colour designs. In flight and habits they resemble the Heliconiids.

M. lysimnia and *M. polymnia* are common in tropical Brazil just after the rainy season but can be found throughout the year, in lesser numbers. In Amapa, Pará, Paraiba and Pernambuco I have seen them at altitudes only a few metres above sea-level; and in Rio de Janeiro, Guanabára and Minas Gerais I have found them in the same quantities between 1000 feet and 4500 ft. They like damp forests and flit about near grasses and bamboos and fern-grown banks, usually in the forenoon before the hot sun has dried up the dew.

Their flight is normally less than 12 feet above the ground; but when some of the forest trees such as the yellow and purple Ipé (*Tecoma speciosa* and *T. curialis*) are in flower they direct their slow and leisurely flight towards the tree tops and remain for hours among the blooms, provided there is a breeze to offset the heat of the blazing sun.

Terence C. Hanson (5242)

PHOTOGRAPHING INSECTS

Camera and lenses

When I was a boy, which was a long time ago, I collected insects. In those days I had no qualms about popping them into a killing-bottle and later arranging their inert corpses on settingboards, before pinning them in neat rows in the draws of a cabinet.

As a young man, I lost all interest in my childhood hobby, but now, in middle age, I have regained it. The big difference is that over the years I have developed a profound distaste for taking life, so today I only photograph insects. This fully satisfies my collectors instinct and it enables me to share my hobby with audiences who see my lectures, illustrated by my own slides.

Photography has advantages over collection, for it is possible to illustrate habits and life-histories, also far more detail can be seen from a pin-sharp slide than with the naked eye; a four-foot long ant carrying a proportionately enormous aphid across a projection screen is an engaging sight indeed. Photographs of insects are of little value unless they are of a high technical quality. Practical information about equipment and methods is not easy to come by, so I will endeavour to describe the basic principles that I have found to work. Today, there are two main types of camera available to the amateur, namely range-finder and single lens reflex. Both come in various formats, but the best for general purposes is 35 mm.

Rangefinder cameras are generally unsuitable for insect photography. They suffer from parallax, which means that the field of view seen through the separate viewfinder is by no means the same as that covered by the lens, particularly at close distances, which makes it extremely difficult to get the subject accurately focussed within the picture area. Also, they are not commonly designed to accept alternative lenses and accessories, which are essential for our purpose.

With a reflex camera, your eye looks through the viewfinder into a prism-and-mirror system that deflects your vision out through the lens. Therefore, the image you see, and that seen by the lens are one and the same thing, so there is no parallax problem. The lens is usually a separate unit attached to the camera by screw or bayonet fitting, so it becomes an easy matter to change lenses from one focal length to another. Also, the lens-boss on the camera will accept accessories such as tubes or bellows, to provide the necessary degree of magnification.

You can probably make good use of the single lens reflex camera you happen to possess, but if you are proposing to buy one especially for this work there is much to be said for choosing a model with 42 mm screw-thread lens mounting, because so many manufacturers have adopted this fitting that it opens up a wide choice of lenses and accessories of various makes. Many reflex cameras have a light-meter incorporated into the viewfinder, but for insect work this is an un-

necessary refinement; indeed, you don't need a light-meter at all, but it's a useful thing to have if you are going to use your camera for conventional photopraphy as well.

The aim of the insect photographer must be to reproduce as much detail as possible, which can only be achieved by high-quality lenses. Macro-lenses, which are especially computed for close-up work, are the ideal, but they are very expensive. However, you should save up to get one if you intend to take your photography seriously, because it is certain that you will aspire to one eventually in your search for perfection.

In the meantime, good results can be obtained from the excellent lenses supplied by leading camera manufacturers for pictorial work, one or more of which you may already have. Most reflex cameras are sold with a standard lens of around 50 mm. focal length, but it is likely to stop down to no smaller aperture than f.16, which is a disadvantage. Another drawback of a 50 mm. lens is that the working distance between lens-end and subject is only 2″ to 3″ when using tubes or bellows. This makes the photographers' task very tiresome when approaching large active insects; try getting your lens to within 2″ of a wild butterfly, and you will see what I mean!

The ideal focal length for general use is about 100 mm. Many pictorial photographers own a 105 mm. telephoto lens and this will do well, but unfortunately the popular 135 mm. telephoto is just a little too long. With a lens of any focal length between 90 and 105 mm. the working distance between lens and subject will be some 5″ to 12″ according to magnification, which makes approach much easier. Moreover, most telephoto lenses stop down to f.22, which setting should always be used for photographing insects because it increases the depth of field (i.e. the range of sharp focus) very markedly. Macro-lenses used to be made in 50 mm. only, but several of the more enlightened manufacturers now offer them in the preferable 100 mm focal length.

A 100 mm lens will cope with any insect from the size of a dragonfly down to that of a bluebottle, but if you want to photograph the vast array of insects smaller than a bluebottle you will need a shorter focal-length lens to obtain a worthwhile image size on the film. It is fair to say that the smaller insects are the less active on the whole, so your 50 mm lens can be used to take you a long way down the size-scale, but remember it only stops down to f.16, so you may experience some depth of field problems. A 50 mm macro-lens does, of course, always stop down to at least f.22.

The really small organisms, like ants, fleas and aphids, can be photographed very dramatically with an ordinary 35 mm, or better still 28 mm, wide-angle lens that so many photographers possess. A wide-angle lens is designed to provide a small image of a large area. If you reverse it and use it back-to-front, it provides a large image of

a small area, in other words a high degree of magnification. Unfortunately, it only stops down to f.16, while lens-to-subject distance is less than 1″ with tubes or bellows, so a high percentage of reject slides must be expected, but when you do get everything right you often obtain a startling picture. I will say more about this technique later on.

Magnification and Illumination

1 have described above cameras and lenses suitable for insect photography. I will now discuss the remainder of the equipment needed by the amateur enthusiast.

If you screw or clip a 100 mm lens, which I recommended as being the ideal focal length, directly into the lens-boss of a reflex camera and look through the viewfinder, objects will merely appear fifty per cent nearer to you than they actually are, while anything less than a yard or two will be below the range of sharp focus. This, plainly, is useless for insect photography.

It is possible to achieve a certain degree of enlargement of the subject by screwing supplementary lenses into the filter-thread of the main lens, but supplementary lenses have a very limited range of magnification and I do not recommend their use. Much greater and more flexible magnification is achieved by extending the main lens away from the film plane; the further away you extend it, the greater will be the magnification. Extension is achieved either by placing specially designed tubes between lens and camera, or by using expanding bellows in the same position. I will deal with the two methods separately.

Tubes are usually supplied in the form of three individual rings, which screw or clip into each other to form a tube-set about 2″ long. The rings are of different lengths, namely long, medium and short. They can be used separately, or all three together. Furthermore, you can use more than one tube-set to achieve increased mangification; I have often used up to three tube-sets screwed together, looking like elephants trunk sticking out of the camera, with the lens on the end.

Rings have one great asset, namely that "auto" rings, which are the only sort you should use, have a pin running through them that closes down the lens-iris at the moment of firing the camera. The pins coincide from one ring to another, so that with several rings, or even with several tube-sets in use, they will still effect the closure of the iris.

This is a very neat arrangement, but rings have a serious disadvantage, in that they are so inflexible. Imagine that you are stalking a Peacock butterfly feeding on the head of a thistle. Your experience tells you that this large subject requires only the medium ring one tube-set to make it fill the picture nicely. As you are approaching, the Peacock suddenly flies away, but at that moment a Small Copper poses beautifully on a nearby flower. You know that you need greater magnification for the Copper, so you frantically unscrew your lens, grapple in your pocket

for some more rings, screw them on, screw back the lens (sooner or later you will drop it), and just as you are ready the Copper takes off! Some of my best pictures have been taken with rings, but constantly changing them to suit the size of the subject is most frustrating. Nevertheless, there is much to be said for a beginner making a start with one or two tube-sets, before graduating to the more problematical bellows later on.

The advantage of bellows is that magnification is infinitely variable at the turn of the knob that extends them. This facility will gain you many oppartunities for quick shots that you would lose while fiddling with rings, but there are snags too.

When you screw your lens into the bellows, and you attach the latter to the camera, you have lost all means of closing down the lens-iris, other than by hand, which is hardly practicable (I must explain that it is essential to focus at open aperture, because when the iris closes to f.22 you can see precious little). This difficulty can be overcome in two ways, but both have associated problems. The easy way is to buy an auto-bellows, which has a rod, or some such device, running along beneath the slide-bars. When the camera fires, the "shoe" inside it kicks the end of the rod, which in turn prods in the iris-closing pin of the lens at the precise moment that the shutter opens.

There are two snags with auto-bellows. First, they tend to be rather expensive. Secondly, they are generally designed so that the camera remains stationary at one end of the bellows, while turning of the extension-knob causes the lens to advance down the slide-bars, away from the camera. This implies that the rods protrude well beyond the lens, which is a nuisance. After all, if you are approaching a shy insect, you don't want to introduce yourself by poking it in the ribs with a pair of chromium-plated rods! Furthermore, if you are using a short focal-length lens for high-magnification work, you will need to get the lens-end to within 1″ of the subject, which the protruding rods will render impossible if the insect happens to be sitting on the ground.

The ideal arrangement is for the lens to remain stationary and jutting out from the far end of the bellows, while the camera moves up and down the rods, which extend back towards the photographer. Such bellows are indeed available and have the added advantage of being quite cheap. They can be ordered with fitments to suit most makes of camera, but they are non-auto, so the problem once more is how to close down the lens-iris.

Certainly in the case of cameras with 42 mm screw-fitting lenses, this problem can be overcome by the use of two release-cables and a plunger. One cable goes into the firing-button of the camera, but what to do with the other is more problematical. If you are lucky enough to own a (now discontinued) Schacht Travener 90 mm lens it is easy, because it has a socket in its base-ring to accept a cable. Otherwise,

you will have to use what is called a "Z" ring, which fits between bellows and lens and which has a socket in its side to accept a cable and a device within itself to press down the iris-closing pin when the plunger is depressed. I know that a "Z" ring, complete with plunger and cables, is available for 42 mm screw-fitting lenses (the ring and plunger are good, but discard the cables as being weak and floppy and replace them with stout plastic-covered types), but don't I believe one is available for bayonet fittings. Very great care must be taken over the adjustment of the two cables, so that when the plunger is depressed the one completely closes down the lens-iris a fraction before the other fires the camera.

Slight modifications will need to be made to normal procedure with a wide-angle lens in reverse position for high-magnification work. First, you will need a reversing-ring, to screw into the filter-thread of the lens, The ring has 42 mm thread at its other end, so that the lens can then be screwed, back-to-front, into the end of the bellows. The "Z" ring is then screwed onto the outward-protruding base-thread of the lens, where it will press down the iris-closing pin in the usual manner when the plunger is depressed.

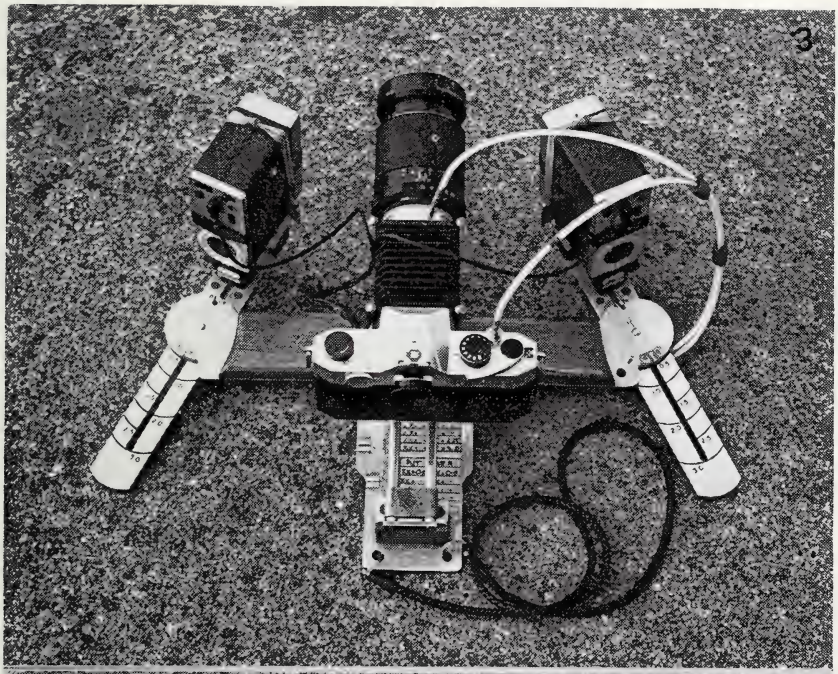
The only other problem is where to locate the plunger, which cannot be tolerated just flopping about, but I will deal with this matter when I come to discuss equipment lay-out.

Now we have to consider how to illuminate the subject. If you extend your bellows several inches, or put on one or two tube-sets, close down your lens to f.22 and take a photograph of an insect at 1/60th of a second in the brightest sunshine, you will get back from the processers a piece of virtually unexposed film, due to lack of light on the subject. Hence, it is plain that the subject must be lit by a bolt of light of enormous intensity at the insant of exposure of the film. The only way to achieve that, out in the field, is with electronic flash.

It is much better to have plenty of light than too little; it is easy enough to cut light down, but you cannot increase what you have not got. So choose a gun, or guns, with a good strong output. I use a pair together, one on each side of the camera, each having a flash-factor of 89 at 50 ASA. Electronic flashguns in the last two years or so have nearly all gone computerised and quite honestly I have no experience of them. My guns have a fixed output, with full and half-power selection switches on the back, and a flash-duration of 1/13000th of a second. Like many good old-fashioned things today, the maker has

Fig. 3. The Author's apparatus. From top to bottom: lens hood, 100 mm Macro-lens flanked by twin flashguns, "Z" ring (accepting lens-iris closing cable), bellows, camera body (accepting shutter-release cable), bellows slide-bars. All mounted on aluminium platform.

Fig. 4. Underside of platform, showing arrangement of firing-plunger and wing-nuts for adjusting flash-bars.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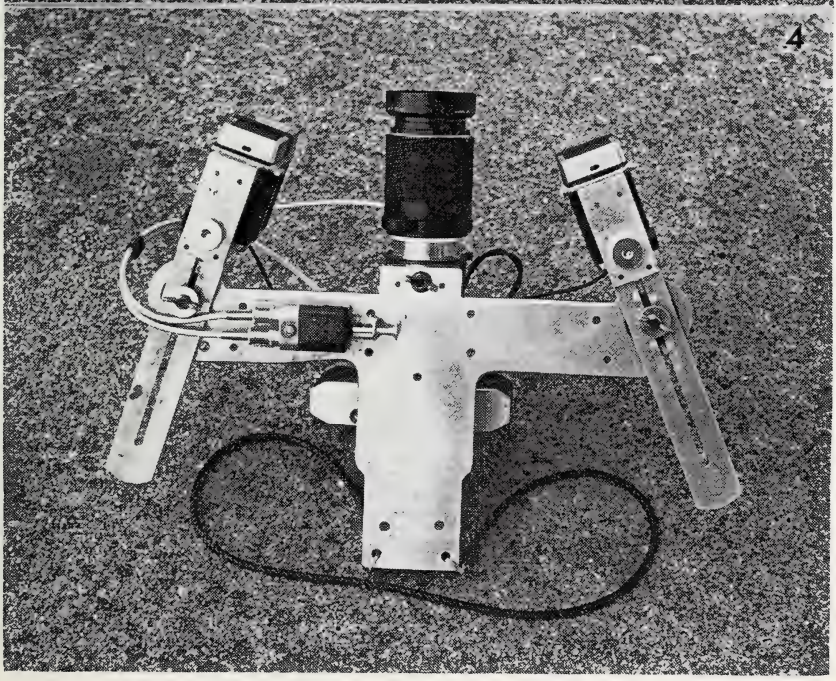
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discontinued them, so if I can get no equivalents when they wear out I will have to do some experiments with the computerised type, and so it seems will you, because the best I can do is to describe my own equipment. In any event, flashguns should be rechargable; it is mostly those with small outputs that run on batteries, and they are not much use for our purpose.

Positioning of the light-source is very vital. The thing to remember is that the closer the source to the subject, greater will be the intensity of light falling upon it. So if you find you get under-exposure, perhaps due to your flashgun being a little on the small side, move it closer to the subject. If you get over-exposure, move it away.

Equipment lay-out

Having described the basic equipment needed for insect photography, I will now make some suggestions regarding how to combine the individual components into a compact assembly that can be taken out into the field. Perhaps it would help if I were to retrace my own steps from a very elementary beginning.

When I first started, about eight years ago, I already had a reflex camera, a 105 mm lens and a small flashgun. All I needed to buy was a tube-set to be in business, or so I imagined.

I mounted the flash on the bracket on top of the camera and decided to do a test run. It was wintertime, so I cut butterfly shapes out of brightly coloured cardboard arranged them on an evergreen bush in the garden. I had no idea where I would find the correct exposure balance between the output of my flashgun and a particular aperture and I imagined that the degree of extension would make a big difference to the exposure, so I drew up a table, as follows:—

Ring size	Shot 1	Shot 2	Shot 3	Shot 4
Short	f.8	f.11	f.16	f.22
Medium	,,	,,	,,	,,
Long	,,	,,	,,	,,
All three together	,,	,,	,,	,,

I loaded with 25 ASA colour film and fired these off, commencing at the top-left and working across, like reading a book. In due course, I was surprised to find that f.11 gave good exposure for all ring sizes. I now know that the reason is that the greater the extension, the nearer does the lens have to be to the subject when it swims into focus (focussing is achieved simply by swaying the body a fraction nearer to or further away from the subject, with the lens set at infinity). Therefore, the flashgun is also brought closer to the subject when using longer extensions, thereby counter-balancing light-loss occasioned by additional ring-length.

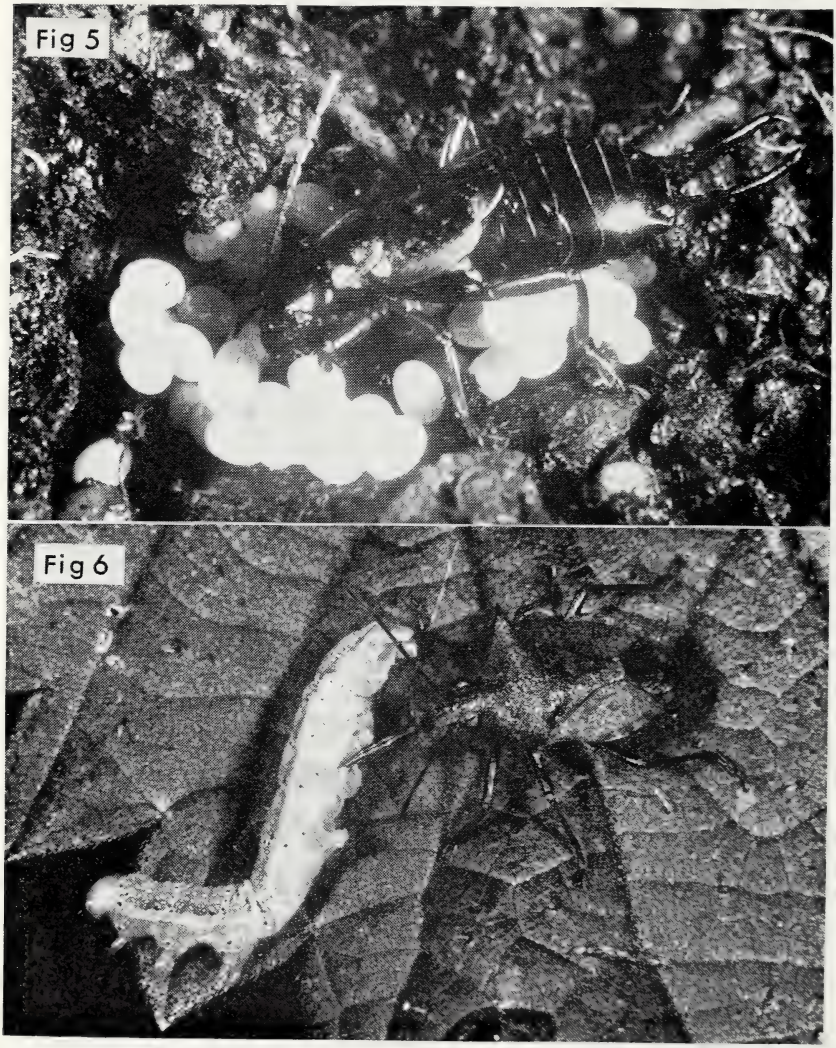
That spring, when I went chasing real butterflies, my troubles began. I found that the quality of exposure at f.11 was always excellent, but very seldom could I get a picture that was sharp all over, and there is nothing that is more disturbing on a projection screen than a close-up of an insect with a part of its body "fuzzy".

I realised that I needed to use a smaller stop to gain increased depth of field, but knew that if I did so my illumination would be inadequate, so I traded in my flashgun against a bigger one. I also bought an upright "L" shaped handle-bracket to mount it upon, which was nice because I could hold the grip in my left hand and operate the camera button with my right, which gave me much better control over involuntary movement when focussing. On the top of the bracket I fixed an inclining and swivelling mount for the flashgun so that it could be directed slightly downwards and inwards, to beam directly onto the subject.

With this outfit I found I had gained a whole stop, to f.16 using 25 ASA film, or to f.22 using 50 ASA stock. Many of my pictures were now sharp all over; indeed, they started winning Club competitions and being accepted by Exhibitions. However, I was not entirely satisfied. I really wanted to get down to f.22 stop, and yet be able to use 25 ASA film, because there is no doubt that the lower the ASA rating, the finer the detail will be on projection. I was already using quite a big gun and there was not a reasonably compact model available with twice the output necessary to gain me a stop, so the answer seemed to be to use two. Had I known then what I know now I would probably not have done that; instead, I would have made some arrangement to run the gun out nearer to the subject, but then I would not have got the beautifully evenly lit pictures that are my pride today.

Now I had a problem, because it seemed unfair to my delicate and expensive camera to try to hang two heavy flashguns from its base-plate, so from $\frac{1}{8}''$ thick aluminium sheet I made a "platform" upon which to mount all my gear. It was shaped like a boomerang, but with one arm only half the length of the other. The camera body sat along the longer arm, on a thin rubber pad stuck to the metal, to stop it from swivelling around. It was firmly held there by a screw that passed through the thickness of the aluminium and the rubber pad, to enter the tripod-bush in the base-plate of the camera. As a later refinement, the plain screw was replaced by the screw on a pistol-grip, which had a trigger to activate a cable that entered the camera-firing button. This enabled me to hold the apparatus from underneath, which gave me good control over it.

The two flashes were mounted at the end of the short arm of the platform. I made no attempt to elevate them, but realised that it would be necessary to be able to angle them in or out to a small degree according to the distance of the subject from the end of the lens, this in turn being governed by the amount of extension being employed.



Figs. 5 & 6. Two photographs from colour tranparencies taken by the author with his apparatus.

Fig. 5. Earwig with eggs. (50 mm Macro-lens).

Fig. 6. Shieldbug, *Picromerus bidens* L., feeding on caterpillar. (100 mm Macro-lens).

To achieve this, I made a little aluminium turntable, screwed to the platform through a rubber washer that acted as a rotation-damper. The two flashes sat on stub-brackets mounted side-by-side on the turntable and were lashed together by a stout rubber band. Their cable both went into the "X" socket of the camera via a tiny two-way adapter that is readily obtainable.

This contrivance worked spendidly and I used it for several seasons, but I found fiddling with rings increasingly irksome, until finally I decided to make the change to bellows. My idea of employing an aluminium platform had worked so well that I decided to adopt it again. This time, I thought I would separate the flashes, so they stood one on each side of the camera. I believed this would provided even more lighting, and I was right.

The shape of the platform that I finally designed, and still use today, is like that of an aircraft. The lens projects beyond the "nose" and the bellows runs down the "fuselage". A flashgun is mounted on each "wingtip". They are not directly attached to the platform, but sit on the ends of flash-bars of the type with a long slit down the centre-line. Thumbscrews go through the slits, through rubber damping washers, and into threaded holes in the aluminium "wingtips". The flashes can be angled in or out against mild resistance from the rubber washers, but when the thumbscrews are loosened the guns can be run forward several inches nearer to the subject. This makes possible very fine adjustment to the intensity of illumination of the subject, according to whether it is on a pale or dark background, by moving the flashes a little nearer to or further away from it. Such flexibility is also essential for different lenses, each one of which has its optimum flash setting, which can only be learnt from experience.

The bellows unit is of the type that I previously described, with which the lens remains stationary and the camera retreats backwards down the slide-bars. I grasp the apparatus in both hands by the two "wings", there just being room for a hand on either side of the camera, between the bellows and the flash-bar mountings. I found that the edges of the flat aluminium hurt my fingers when I gripped it hard, so I shaped pieces of $\frac{1}{2}''$ thick mahogany and screwed them to the metal on the topside. When varnished, these "handlebars" gave the apparatus a pleasing appearance and the warm wood conveys a sensation more akin to holding a gun than a camera. This impression is heightened by the fact that I screwed the plunger for the two cables to the underside of the right-hand "wing" and operate it like a trigger, with a sideways movement of my thumb.

A stout neck-cord is attached to the "tail" of the platform, so that the apparatus hangs down against my waist-line when walking, in instant readiness for use, but leaving my arms free to swing. It weighs

an awful lot, but I've got quite used to it and can carry it all day without tiring.

You may not wish to go to the lengths of designing and making a platform, but a lot of fun and some very good pictures can be had if you only reach the earlier stages I have described. On the other hand, I am sure that there must be infinite variations of lay-out that you can adopt for your assembly, the design and construction of which will be an absorbing challenge to your ingenuity if you are technically minded. In any case, I would like to wish "good shooting" to those of you who decide to take up this fascinating branch of photography.

D. K. H. MARTIN, A.R.P.S.

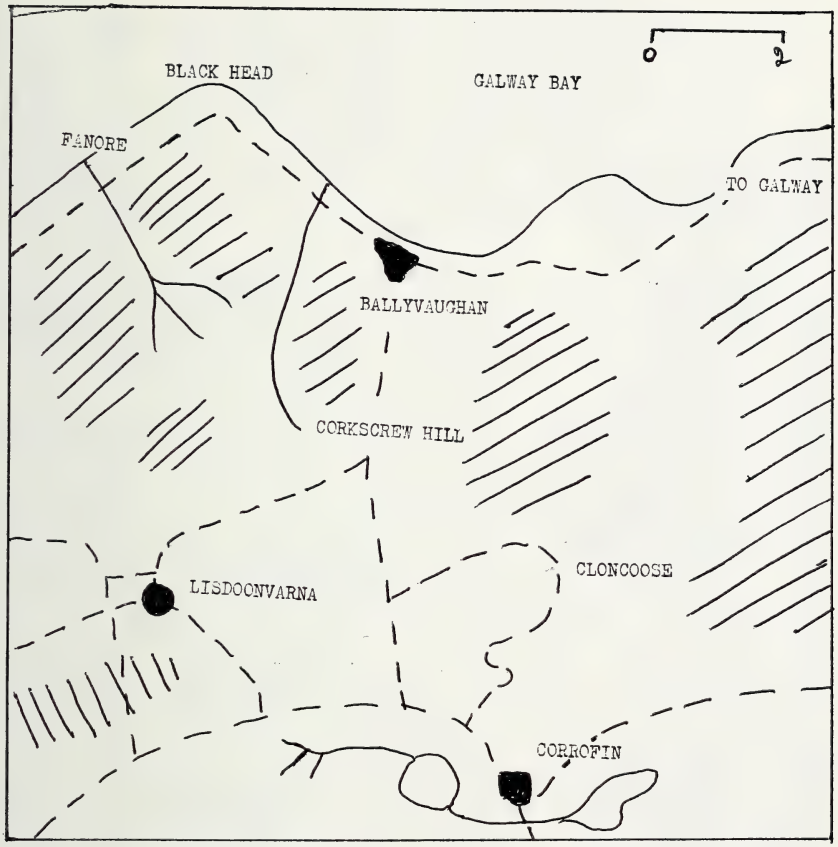
BURREN LEPIDOPTERA IN 1975

The Burren is a limestone region in Co. Clare, West Ireland. It is unique in its flora and fauna, due to its clint and gryke structure (limestone paving), vast areas of bare rock, closeness to the sea, and its light, dry, exceptionally warm soil. This supports both mediterranean and alpine plants. How they got there is still a mystery, but they are probably interglacial relict flora. It also has an extremely interesting insect fauna. The recently discovered moth, the Burren green (*Calamia virens* L.) has its only location in the British Isles here. It is also the only Irish location of the Pearl-bordered fritillary (*Bolaria euphorosyne* L.) and the Irish form of the transparent Burnet (*Zygaena purpuralis* (Brunne)). We were there on the last two days in June and first fortnight in July. This account is not of the Burren specialities as there were few out at that time, but of the great variety and abundance of lepidoptera to be found in this extraordinary region of Ireland in just two weeks.

As we were camping our collecting apparatus had to be light and small. So we used one 80 watt mercury vapour combined tungsten filament lamp which fits an ordinary light socket. We used the lamp with a sheet and then netted the moths. We would like to thank Mr. F. Haynes for the use of his moth trap at Ballyvaughan and for his very useful advice regarding the Burren.

The interior part of the Burren consists of huge bare pavements of limestone in the gaps of which ferns, including the maiden hair fern, may be found. Bedstraw and wild Thyme which are flowering in brilliant yellow and pinks, form large patches of colour on the bare rock. There are also Ivy and Violets; also great varieties of grasses. Here and there the odd few Hawthorns could be found, never more than 8-10 feet high. There were large areas of Hazel in the lowlands around Ballyvaughan, and in some places these formed thick, impenetrable shrubland.

Our first collecting area was situated at Corrofin. In this area there were many Turl lakes, i.e. lakes which dry up in summer. When we were



MAP OF THE BURREN

there they had shunk quite substantially, and were surrounded by soft mud which was colonised by various species of spurge, hawthorn, bramble, willows buckthorn, holly, and in pasture fields thistle and ragwort etc. were common. Many species of marsh plants also grew beside the lakes. Hazel shrub was also found towards the north. We had our M.V. operating for one night in an open barn. The catch is recorded in the table. We sugared with little success, only catching one peach blossom moth (*Thyatira batis* L.).

Our next collecting area was near Lisdoonvarna, and was concentrated in and around a small limestone river valley. It was mainly covered with grass, though there were patches of bare limestone around the now almost dry river. The north of the valley was damp, full of flowers and a paradise for butterflies. Our M.V. lamp was used out in the open against a white washed wall for one night. Sugaring was unsuccessful.

	Corrifin	Lisdoonuarna	Corkscrewhill	Ballyvaughan	Fanore
NOCTUIDAE					
Agrotis exclamationis (L.)	u			c	
Lycophotia varia (de Vill)				c	
Amathes c-nigrum (L.)				u	
Axylia putris (L.)	c	c	c	c	
Ochpople plecta (L.)	c	c	c	c	
Apatele psi (Shiff)		u		u	
Cucullia umbratica (L.)				c	
Apamea secalis (L.)	c	c	c	c	
Noctua pronuba (L.)	c	c	c	vc	
Euschesis comes (Hubn.)				c	
Euschesis janthina (Shiff)			u	c	
Thalapophila matura (Hufn.)				u	
Polia nebulosa (Hufn.)			c	u	
Procus latruncula (Haw.)			1		
Procus fasciuncula (Haw.)			c	c	
Apatele megacephala (Schiff)			u		
Plusia chrysitis (L.)	c	c	c	c	
Plusia bractea (Shiff.)		u	u	u	
Plusia festucae (L.)			u		
Plusia gamma (L.)			u		
Plusia jota (L.)	c	c	c	vc	
Plusia pulchrina (Hubn.)	u	u	u	c	
Unca triplasia (L.)			u	c	
Unca trigemina (Werneberg)			u	u	
Diataraxia oleracea (L.)	c	u	u	c	
Melanchra persicariae (L.)		u		u	
Apamea monoglypha (Hufn.)	u	c	c	c	
Leucania halbens (L.)	c	c	c	c	
Leucania impura (Hubn.)		u		u	
Leucania conigera (Schiff.)				c	
Euxoa tritici (L.)			c	c	
Hadena rivularis (L.)		u			
Phlogophora meticulosa (L.)			u		
ARCTIDAE					
Lithosia lurideola (Zinck)				2	
Nudaria mundana (L.)				c	
Spilosoma lutea (Hufn.)	vc	vc	vc	vc	
Spilosoma lubricipeda (L.)	vc	vc	vc	vc	
Arctia caja (L.)				c	
Setina irrorella (L.)				1	
LASIOCAMPIDAE					
Malacosoma neustra (L.)				vc	
Lasiocampa quercus (L.)					1
Macrothylacia rubi (L.)					1
Philudoria potatoria (L.)				vc	
THYATRIDAE					
Thyatira batis (L.)				c	
Habrosyne pyritoides (Hufn.)	u			c	

	Corrifin	Lisdoonuarma	Corkscrewhill	Ballyvaughan	Fanore
SPHINGIDAE					
Deilephila elpenor (L.)			1		
Laothoe populi (L.)				c	
NOTODONTIDAE					
Pheosia tremula (Clerck.)		1			
Notodonta dromedarius (L.)				u	
Lophopteryx capucina (L.)				u	
Notodonta ziczac (L.)			1		
Phalera bucephala (L.)				2	
ZYGAENIDAE					
Zygaena purpuralis (Brunn.)	u				
Zygaena filipendulae (L.)	u				u
HEPIALIDAE					
Hepialus humuli (L.)	c	c	c	c	
Hepialus lupulina (L.)	u	u	u	u	
Hepialus fusconebulosa (de Greer)			u		
GEOMETRIDAE					
Abraxas grossulariata (L.)	c	c	c	c	
Gnophos obfuscatus (D. & S.)				2	
Gnophos obscuratus (D. & S.)	1				
Hydriomena furcata (Thunb.)				c	
Selena bilunaria (L.)				u	
Biston betularia (L.)	u	u	u	u	
Ourapteryx sambucaria (L.)	u	u	u	c	
Opisthographes luteolata (L.)	vc	vc	vc	vc	
Ortholitha chenopodiata (L.)					1
Henuilea aestivaria (Hubn.)				u	
Geometra papilionaria (L.)				u	
NYMPHALIDAE					
Argynnis aglaja (L.)	c	u	vc	u	u
Aglais urticae (L.)	u	u	u	u	
Inachis io (L.)	1				
PIERIDAE					
Pieris napi (L.)	1	2	2	2	1
Pieris brassicae (L.)	c	u			
SATYRIDAE					
Coenonympha pamphilus (L.)	c	c	c		
Lasiommata aegeria (L.)	c				
Aphantopus hyperantus (L.)	c	c	c	c	c
Hipparchia semele (L.)					1
Maniola jurtina (L.)	c	c	c	c	c
LYCAENIDAE					
Cupido minimus (Fues.)	c				
Polyommatus icarus (Rott.)	c	c	c	c	c

The pretty little chimney sweeper moth (*Odezia atrata* L.) was common here. At the corkscrew hill, which is near the village of Doonyvarden, we entered the Burren proper, because bare limestone rock stretched for miles; in between the limestone paving was lush vegetation. The odd few stunted bushes rose against the white desert-like landscape which sheltered so much life in its cracks. We used the M.V. lamp for two nights and sugaring obtained one light form of the grey arches *(Polia nebulosa* Hufn.) The dark green fritillary (*Argynnis aglaja* L.) was very common here.

We spent a lot of time at Ballyvaughan, our 4th collecting area. This area was very mixed; stretching in about a mile radius around the town was a belt of green pasture and woodland; along the coast towards Black Head vast areas of limestone pavement stretching down to the sea; inland woodland and limestone rock are to be found. We used our own M.V. lamp for one night, and the use of Mr. Haynes' M.V. trap for a further 5 nights. During our first few days at Ballyvaughan the weather had changed from very hot and dry to thundery with heavy showers; this didn't seem to effect our catches, but sugaring again proved unsuccessful. While we were in Ballyvaughan we went to Fanore which is on the other side of Black Head. This is the locality in the Burren for the transparent Burnet (*Zygaena purpuralis*). Although we found none on the wing we found their breeding site by finding empty and parasitised and diseased cocoons which were identified. The colony would appear to be substantial in size due to the large number of empty cocoon cases. However, one specimen was captured in a bare limestone area of corrofin at the beginning of our holiday. The vegetation was typical dune vegetation; trefoils, bedstraws, wild thyme, maram grass etc.

This year the Burren had one of its driest summers for many years. There had been no rain for nearly 3 months and the sun had shone almost continuously. When we were there almost all the grass had been burnt yellow and there was a scarcity of water, although this didn't effect the populations of lepidoptera when we were there.

David N. Dowling (5552 J)
Michael de Courcy Williams (5555 J)

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SWALLOWTAILS IN SOUTH WESTERN ONTARIO, CANADA

To many lepidopterists the genus *Papilio* is a favourite group of butterflies to study. They are usually large, brightly patterned and look striking in collections. This group is very well represented in the warmer climates but not so in the more temperate zones. This paper outlines some information on swallowtails from South Western Ontario, Canada,

including experiences of my own, and I hope those members interested in this group will find it enjoyable.

The region of South Western Ontario (See map) gives rise to over one hundred species of butterfly. This includes resident and migrant species. The genus *Papilio* is represented by two fairly abundant species in this region. However, records from the past indicate that at one time no less than six species of swallowtail were to be found in this region.

First, let me give a brief glimpse of the two abundant species of swallowtail.

Our most common swallowtail is a representative of the *machaon* group. This is *Papilio polyxenes asterius* Stoll, commonly called the Black or Parsnip swallowtail. Its range extends from Eastern Canada down through the Atlantic and Mid-Western United States to Central America. Its larvae feed on various species of Umbelliferae. In this region there are two definite broods each summer. The first brood emerges towards the end of June and second during early August. Occasionally an early brood emerges during May if weather conditions are right. These represent so-called "cold weather" forms and are smaller than the summer stock.

P. p. asterius is usually confined to meadows, fields and gardens usually avoiding heavily wooded areas. It is a strong flyer but flies low and is best taken at flowers.

This species is very simple to rear and ova are easily obtained by observing ovipositing females. The ova are laid singly on the young plants of wild carrot and other Umbelliferae.

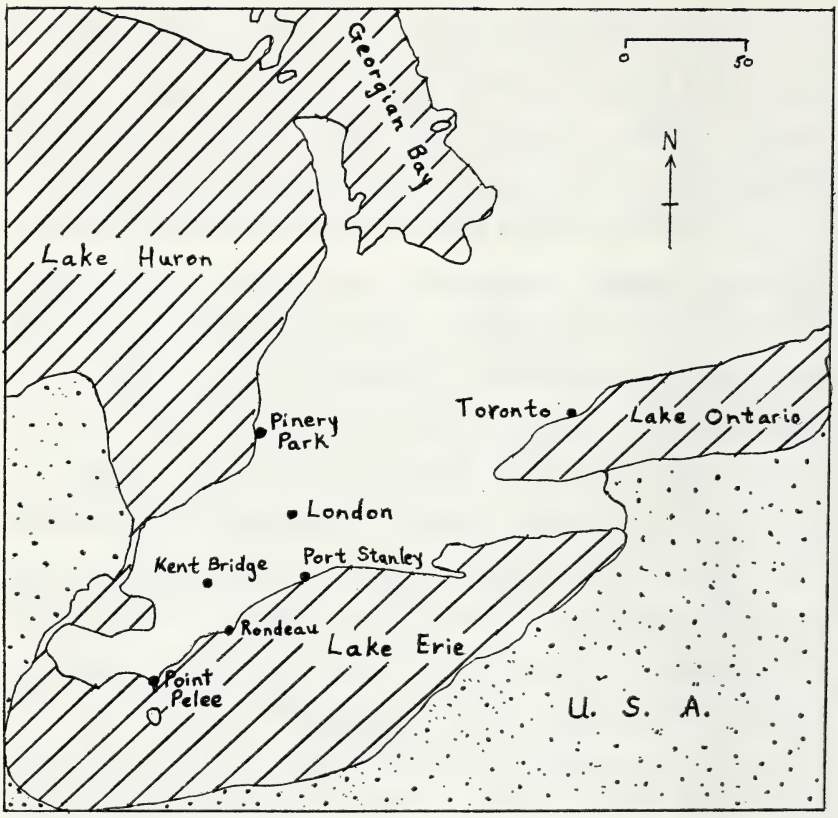
This species can also be crossed with *P. machaon* Linn. to produce an interesting hybrid. These have been sold by English dealers in the past.

As one goes further north in Ontario this species becomes scarcer and is replaced by *P. machaon hudsonianus* Clark. There is no overlapping of the two species and *P. m. hudsonianus* is still a scarce butterfly even in the north western parts of the province.

The other abundant species in this region is *P. glaucus glaucus* Linn. Commonly called the Tiger swallowtail, its pattern of black and blue on a yellow background handsomely earns its name.

The adults appear towards the end of June and there is a second brood in late July-early August. It is a woodland species and a strong, high flyer. It also is best taken at flowers or damp sand.

In the southern United States some females of this species are dimorphic, appearing a dark brown colour entirely. This is called var *turnus* Linn. A dimorphic female emerged from larvae collected on hop tree at Point Pelee (See map). Point Pelee is the southernmost tip of Canada and is on the same latitude as the boundary of northern California. Many unusual flora and fauna exist here and are found nowhere else in Canada.



P. g. glaucus extends northwards in Ontario until it overlaps with a sub-species called *P. g. canadensis* R. & J. in more typical Canadian zone forest areas. This is a smaller butterfly and is a paler yellow colour.

P. g. glaucus feeds on a wide variety of trees, such as Cherry, Tulip tree, Birch, Poplar, Ash and Basswood. The ova are usually laid singly on the underside of leaves and the larva has false eyespots similar to those of *Deilephila elpenor* Lin., to frighten away enemies.

In the past records indicate that two other species were to be found in this area. J. H. Fauld, in his "The Natural History of the Toronto Region", published by the Canadian Institute in 1913, lists *Iphiclides ajax* Linn. (now called *Graphium marcellus* Cramer), and *Laertias philenor* Linn., now re-christened *Battus philenor* Linn. The collection of the Royal Ontario Museum, Toronto, contains specimens of *G. marcellus* from the Toronto area taken at the turn of the century.

As no sightings or captures of *G. marcellus* have been reported for most of this century I think it would be safe to say that it is extinct

in South Western Ontario. The food plant Papaw, is very scarce in this region and the only Papaw tree I have ever seen is located on the grounds of the University of Western Ontario in the city of London.

It would appear also that *B. philenor* is also going the way of *G. marcellus,* probably due to the lack of its food plant, pipevine, and the destruction of its habitat by increasing development in the province. A specimen was taken at Dunnville in Haldimand County on October 15, 1973, and I also have a specimen taken in London in 1956. This was given to me by its captor when he turned his interest over to moths.

My estimates are that it does exist here in certain areas and is probably overlooked by many lepidopterists, including myself. However, until more of this region is explored it is safe to say that it is a very rare insect indeed.

Two other swallowtails can be taken also but these are confined to certain localities. One of these is the largest North American butterfly *Papilio cresphontes* Cramer., the Giant swallowtail, and the other is *Papilio troilus* Linn., the Spicebush swallowtail. The following experiences are related to the search and capture of the above species.

For five years (1963-1968) most of my collecting was confined to the area around London. Various reference manuals informed me that *P. cresphontes* and *P. troilus* should be, if not abundant, easily taken in my area. However, such was not the case for this length of time, and I resigned myself to the fact that *P. p. asterius* and *P. glaucus* were going to be the only swallowtails I was to be exposed to.

As it happens I also happen to be a part-time musician and one day while attending a "jam" session at another fellow's home, I received my first clue to the availability of *P. troilus.* There on the wall inside the front door was a large riker mount containing various specimens of butterflies, all faded of course, and showing signs of pest eaten abdomens. I did a double taken when my eyes fell across a row of half a dozen swallowtails which were instantly recognized as something completely alien to me. Closer examination revealed *P. troilus* in various states of decay complete with antennae and no data.

"Port Stanley", my host said, "Lots of them, all over the beach area, sometime in the summer." I tucked the information away for future reference.

The next summer, 1968, several pilgrimages were made to the Port Stanley area. Beaches were combed, roadsides, fields, wooded areas, all to no avail. I did however discover its food plant, Sassafras, growing in the area. Perhaps I just chose the wrong time of the season.

May 18, 1969 found me in the Pinery Provincial Park (See map) collecting early spring specimens. Collecting was good and while walking down one of the forest paths a medium size black butterfly

rushed over my head and proceeded in the direction I was walking. Instantly I recognized it as not being *N. antiopa* Linn., which was common in the park, and gave chase. After a quick sprint the insect was in my net and lo and behold, *P. troilus,* a male and in perfect condition! This was the last place I expected to find this species because it is further to the north and I had never run across its food plant. I now believe that this is probably the most northern limit of its range in Canada because no records indicate any captures further north. Most captures come from along the Lake Erie shoreline. Now subsequent visits to the park turn up specimens although it is never plentiful in this locality.

My next encounter with *P. troilus* was in Point Pelee National Park. Here its food plant is common and the insect seems very well established. The same can be said for Rondeau Provincial Park.

P. cresphontes is always a prize for a Canadian lepidopterist. It apparently is a migrant from the United States and breeds in certain localities in Ontario during the summer. In the South its larvae make a pest of themselves on citrus trees. Here in the north it feeds on Prickly Ash and Hop tree. One specimen in my collection is from London but I did not take it. I have never seen it in this area.

From other collectors I knew it is easily taken at Point Pelee but the authorities there take a dim view of collectors, and quite rightly so, in this beautiful place.

Another "hot tip" from a Toronto friend sent me to a tiny place called Kent Bridge, situated about fifty miles south-west of London. At this place he describes driving his car into a field with his son sitting on the bonnet netting *P. cresphontes* at random as they lazily fed in the afternoon sun.

As with most "hot tips" my visions of fields laden with this insect floating about for the taking vanished as soon as I arrived at the fabled spot. The date was August 9, 1970, a hot, humid day with plenty of sunshine. As usual with my luck not a butterfly in sight except good old reliable *Pieris rapae* Linn. and *Danaus plexippus* Linn.

Had I found the wrong spot? I double checked the directions, landmarks, everything. This was it. A field full of nothing but weeds and in the prime flying time for *P. cresphontes.* A check of the field revealed nothing except the above mentioned species. A butterfly the size, nearly 15 cm. wingspan, and colour, chocolate and yellow, of *P. cresphontes* can't easily be missed even at a great distance.

I decided now to check the surrounding small wooded areas to see what I could find. Upon stepping into the first small clearing a nice surprise greeted me. Not *P. cresphontes* but several *P. troilus,* both sexes, flapping happily about. "Great," I thought, "A new locality for this species", and went about adding a few of them to my collection. The further in the wood I went the more *P. troilus* I saw.

After several hours of looking around I decided it was time to begin the journey home. Just as I emerged from the wood onto the field a lightning flash of chocolate and yellow past over my right shoulder and continued in a straight line across the field and vanished from sight into the opposite wood. No doubt about it, *P. cresphontes* in the chitin. I have never seen a butterfly move so fast. Obviously there was no hope of outrunning it. It had to be taken at rest. Several minutes later I sighted another. This one was gaining latitude and vanished over the tops of some large trees never to be seen again. I stayed another hour but no more were seen. At least I had discovered a new locality for *P. troilus* and had actually seen our largest butterfly.

June 21, 1975 afforded me my next chance to go to Kent Bridge. I thought that as the main summer brood of *P. cresphontes* emerges in mid August ova must be laid sometime near the end of June. As soon as I arrived near the locality on the Saturday morning my theory was confirmed. By some low bushes on the side of the road were two specimens floating lazily about enjoying the morning sun. As I stepped out of the car one flew up over the bushes and out of sight, but the other floated away along the roadside. "This was it at last," I thought. "I'm going to return with one." Carefully I stalked it, trying to get as close as I could. When I was within net range I noticed to my disappointment that its rear wings were in shreds and its fore wings were also badly damaged. I had to stay my hand and overcome that old adage "Even a damaged one is better than nothing". Maybe it's a female. Both sexes look identical in this species.

I watched it for awhile and it turned out to be a female. I observed it lay an egg on a tall bush on the roadside. This was the food plant, Prickly Ash, as my fingers told me when I stepped in to get the egg. She then moved off, flew across the road and out of site as best as her battered wings could carry her. One other specimen was also seen in the area later that day.

Ureka! I had an egg. But what could I feed it when it hatches? Prickly Ash is rare in my area and I don't recall ever seeing any. A quick round of all the florist and garden shops revealed that none stocked any citrus plants. Alas, the young larva emerged and died of starvation.

Six weeks later I returned to the same locality. Along the roadside, *P. p. asterius* was abundant and I stopped the car to observe them for a few minutes. No sooner had I stopped and left the car when a fresh *P. cresphontes* circled the car for a few moments then continued at a frantic pace along the road. One interesting observation here is that I'm sure the colour of my car, yellow, held its attention for a few moments. It must be the brightness of the sun reflecting upon it. However, it didn't hold its attention long enough for me to get my net near it.

Further searching of the area that day yielded no more sightings, and once again I returned home empty handed. Perhaps better luck will be with me next year when I certainly hope to try again for just one of these magnificent butterflies. I'm sure a trip into the U.S.A. might net me one but I will wait until the opportunity comes to catch a home grown Canadian *P. cresphontes.*

Kenneth J. Thorne (3055)

A LIST OF THE FOOD PLANTS OF EAST AFRICAN MACROLEPIDOPTERA

PART 2—MOTHS (HETEROCERA)

(Continued from Volume 34 page 184)

Lasiocampinae (continuation)

Nadiasa livida Holl.—Sapium ellipticum (Euphorbiaceae): Pinus patula (Pinaceae) : Maesopsis eminii (Rhamnaceae).

„ *tessmanni* Strand—Pinus patula (Pinaceae).

„ *ocinopa* Tams—Canarium schweinfurthii (Burseraceae).

Pachypasa subfascia Wlk.—Mangifera (Anacardiaceae) : Markhamia platycalyx, Stereospermum kunthianum (Bignoniaceae) : Bombax (Bombacaceae) : Actrocarpus fraxinifolius, Delonix (Caesalpincaceae) : Cupressus (Cupressaceae) : Persea (Lauraceae) : Ficus (Moraceae) : Eucalyptus, Psidium guajava (Myrtaceae) : Erythrina (Papilionaceae) : Maesopsis eminii (Rhamnaceae) : Prunus persica (Rosaceae).

Pachypasa sericeofasciata Auriv.—Coffea arabica (Rubiaceae).

„ *honrathi* Dew.—Ricinus (Euphorbiaceae).

„ *pallene* B. Bak.—Pinus patula, P. radiata (Pinaceae).

„ *papyri* Tams—Cyperus papyrus (Cyperaceae) : Manihot esculenta, Sapium ellipticum (Euphorbiaceae) : Maesa lanceolata (Myrsinaceae) : Eucalyptus torrelliana (Myrtaceae) : Pinus patula, P. podocarpa, P. radiata (Pinaceae) : Polygonum (Polygonaceae).

Rhinobombyx cuneata Auriv.—Combretum (Combretaceae).

Leipoxais peraffinis Holl.—Landolphia (Apocynaceae) : Quisqualis (Combretaceae) : Musa sapientum (Musaceae) : Maesa lanceolata (Myrsinaceae) : Teclea (Rutaceae).

„ *fuscofasciata* Auriv.—Sapium ellipticum (Euphorbiaceae).

„ *rufobrunnea* Strand—Agathia palmerstonii (Araucariaceae) : Cinnamomum camphora (Lauraceae).

„ *crenulata* B. Bak.—Maesopsis eminii (Rhamnaceae : Burttdavya nyasica (Rubiaceae).

„ *marginepunctata* Holl.—Rubus (Rosaceae).

„ *compsotes* Tams—Schinus molle (Anacardiaceae) : Maerua (Capparidaceae) : Maytenus (Celastraceae) : Dovyalis caffra (Flacourtiaceae).

Schausina clementsi Schaus— Maerua hoehnelii (Capparidaceae).
Trichopisthia monteiroi Druce—Sclerocarya caffra (Anacardiaceae).
Mimopacha gerstaeckeri Dew.—Loranthus, Viscum ugandense (Loranthaceae).
Odontogama nigricans Auriv.—Maesopsis eminii (Rhamnaceae).
Gonobombyx angulata Auriv.—Canarium schweinfurthii (Burseraceae) : Maesopsis eminii, Ziziphus abyssinica (Rhamnaceae).
Gonometa podocarpi Auriv.—Cupressus, Juniperus procera (Cupressaceae) : Pinus patula (Pinaceae) : Podocarpus gracilior (Podocarpaae).
„ *fulvida* Dist.) Acacia mearnsii (Mimosaceae).
„ *postica* Wlk.)
„ *regia* Auriv.—Pinus patula (Pinaceae).
Gonometa nysa Druce—Mangifera indica (Anacardiaceae) : Eucalyptus (Myrtaceae) : Pinus patula (Pinaceae).
„ *drucei* B. Bak.—Acacia mearnsii (Mimosaceae).
Grammodora nigrolineata Auriv.—Albizia (Mimosaceae).
Anadiasa punctifascia Wlk.—Grevillea robusta (Proteaceae).
„ *affinis* Auriv.) Acacia (Mimosaceae).
„ *griseata* Warr. & Roths.)
Dolmannia puhpurascens Auriv.—Cassia (Caesalpiniaceae).
Pseudometa andersoni Tams) Acacia mearnsii (Mimosaceae).
„ *canescens* Tams)
„ *castanea* Hamps—Markhamia platycalyx (Bignoniaceae) : Cyperus exaltatus (Cyperaceae) : Miscanthidium violaceu, Pennisetum purpureum (Gramineae) : Ficus capensis (Moraceae) : Coffea (Rubiaceae) : Smilax kraussiana (Smilacaceae).
Mallocampa audea Druce—Aframomum sp. Elettaria cardamomum (Zingiberaceae).
Gastroplakaeis toroensis B. Bak.—Ficus eriobotryoides, F. lycomorus (Moraceae).
Diapalpus griseus Hering—Prunus africana (Rosaceae).
„ *congregarius* Strand—Brachystegia (Caesalpinaceae) : Bridelia micrantha (Euphorbiaceae) : Pennisetum purpureum (Gramineae) : Gossypium (Malvaceae) : Acacia (Mimosaceae) : Ficus (Moraceae).
Eucraera koellikerii Dew.—Monodora myristica (Annonaceae).

BOMBYCIDAE
Ocinara signicosta Strand—Ficus, Morus alba (Moraceae).
„ *fuscocervina* Strand) Ficus (Moraceae).
„ *ficicola* Westw.)

DREPANIDAE
Isopidia angustipennis Warr.—Mitragyna stipulosa (Rubiaceae).

Epicampoptera andersoni Tams)
„ *marantica* Tams) Coffea (Rubiaceae).
„ *glauca* Hamps.)

EUPTEROTIDAE

Janomima mariana White—Miscanthidium violaceum (Gramineae).

Phiala abyssinica Auriv.—Hyparrhenia rufa (Gramineae).
„ *punctulata* Pagst.—Acacia mearnsii (Mimosaceae).
„ *arrecta* Dist.—Asparagus officinalis (Liliaceae).
„ *atomaria* Holl.—Annona senegalensis (Anonaceae) : Markhamia (Bignoniaceae).

Sabalia jacksoni Sharpe—Euphorbia tirucalli (Euphorbiaceae).

SATURNIIDAE

Attacinae

Epiphora albida Druce — Maesopsis eminii (Rhamnaceae) : Citrus (Rutaceae).
„ *vacuna* Westw. — Neoboutonia melleri (Euphorbiacea) : Maesopsis eminii (Rhamnaceae).
„ *mythimnia* Westw. — Croton sylvaticus (Euphorbiaceae) : Ziziphus (Rhamnaceae).
„ *bauhiniae* Guer. — Ziziphus (Rhamnaceae).

Saturniinae

Argema mimosae Bsd. — Sclerocarya caffra (Anacardiaceae).
„ kuhnei Pinhey — Monotes katangensis (Dipterocarpaceae). The moth, recently described from Zambia, has not yet been recorded from East Africa.

Bunaea alcinoe Stoll. — Schinus molle (Anacardiaceae) : Cussonia, Panax (Araliaceae) : Lonicera (Caprifoliaceae) : Croton, Sapium ellipticum (Euphorbiaceae) : Diospyros (Ebenaceae) : Ekebergia, Khaya (Meliaceae) : Eucalyptus, Psidium guajava (Myrtaceae) : Erythrina abyssinica Papilionaceae) : Piper umbellatum (Piperaceae) : Coffea excelsa (Rubiaceae) : Balanites aegyptiaca (Simarubiaceae) : Aframomum sp. (Zingiberaceae).

Bunaeopsis jeffereyi Beauv. — Mangifera, Rhus (Anacardiaceae).

Nudaurelia arata Westw. — Parkia, Piptadenia (Mimosaceae).
„ *oubie Guer.* — Euclea (Ebenaceae).
„ *anna* Mass & Weym. — Hyphaene (Palmae).
„ *licharbas* Mass & Weym. — Eriosema (Papilionaceae).
„ *belina* Westw. — Copaifera (Caesalpiniaceae) : Terminalia (Combretaceae).
„ *conradsi* Rebel — Eucalyptus ficifolia (Myrtaceae).
„ *cytherea* F. — Euclea (Ebenaceae) : Acacia (Mimosaceae) : Pinus (Pinaceae).

„ *dione* F. — Anacardium occidentale (Anacardiaceae) : Aucoumea klaineana (Burseraceae) : Canna (Cannaceae) : Terminalia (Combretaceae) : Aleurites moluccana, Jatropha curcas, Manihot esculenta, Ricinus (Euphorbiaceae) : Khaya anthotheca, K. grandifoliola (Meliaceae) : Chlorophora excelsa, C. regia, Ficus sycomorus, Morus alba (Moraceae) : Maesa lanceolata (Myrsinaceae) : Eucalyptus deglupta (Myrtaceae) : Cajanus cajan, Erythrina (Papilionaceae) : Theobroma cacao (Sterculiaceae): Trema orientalis (Ulmaceae).

„ *krucki* Hering — Schinus molle (Anacardiaceae) : Acokanthera (Apocynaceae) : Eucalyptus citriodora (Myrtaceae).

„ *walbergi* Bsd. — Schinus molle (Anacardiaceae) : Ricinus (Euphorbiaceae) : Acacia (Mimosaceae).

„ *rhodina* Roths. — Juniperus procera (Cupressaceae).

„ *guenzii* Karsch — Combretum (Combretaceae) : Croton macrostachys (Euphorbiaceae) : Khaya grandifoliola (Meliaceae) : Eucalyptus (Myrtaceae) : Cajanus cajan, Eriosema, Pseudarthria (Papilionaceae) : Prunus cerasus, P. serotina, Rosa (Rosaceae).

„ *alopia* Westw.—Celtis durandii (Ulmaceae).

„ *staudingeri* Auriv. — Mangifera indica (Anacardiaceae) : Albizia falcata (Mimosaceae).

„ *emini* Btlr. — Rhus (Anacardiaceae) : Bridelia (Euphorbiaceae) : Psorospermum (Hypericaceae) : Psidium guajava (Myrtaceae).

„ *amathusia* Weym. — Rosa, Rubus (Rosaceae).

„ *zambesina* Wlk. — Ozoroa mucronata, Mangifera indica, Schinus molle (Anacardiaceae) : Nerium (Apocynaceae) : Delonix regia (Caesalpiniaceae) : Barringtonia (Lecythidaceae) : Deinbollia (Sapindaceae).

„ *tyrrhea* Cr. — Schinus molle (Anacardiaceae) : Acacia (Mimosaceae) : Pinus radiata (Pinaceae).

„ *nictitans* F. — Albizia (Mimosaceae) : Maesopsis eminii (Rhamnaceae).

„ *walbergi* Bsd. — Mangifera indica (Anacardiaceae) : Psidium (Myrtaceae) : Trema bracteolata (Ulmaceae).

Lobobunaea phaedusa Drury — Sapium ellipticum (Euphorbiaceae) : Eucalyptus, Psidium guajava (Myrtaceae) : Rosa (Rosaceae).

„ *saturnus* F. — Acokanthera (Apocynaceae).

„ *laurae* Strand — Sapium ellipticum (Euphorbiaceae).

„ *christyi* Sharpe — Alchornea cordifolia (Euphorbiaceae) : Cinchona (Rubiaceae).

„ *jamesoni* Druce — Mangifera indica (Anacardiaceae) : Celtis durandii (Ulmaceae).

„ *natalensis* Auriv. — Deinbollia (Sapindaceae).

Cinabra hyperbius Westw. — Brachystegia (Caesalpiniaceae) : Protea (Proteaceae).

Melanocera sufferti Weym. — Ochna (Ochnaceae).

Imbrasia epimethea Drury — Canarium schweinfurthii (Burseraceae) : Berlina, Brachystegia (Caesalpiniaceae) : Acacia decurrens, A lahai, Samanea (Mimosaceae) : Maesopsis eminii (Rhamnaceae).

„ *deyrollei* Thoms. — Tamarindus indica (Caesalpiniaceae) : Sapium ellipticum (Euphorbiaceae) : Acacia mollis (Mimosaceae).

„ *truncata* Auriv. — Newtonia (Mimosaceae).

„ *macrothyris* Roths. — Brachystegia (Caesalpiniaceae).

„ *eblis* Streck. — Mangifera indica (Anacardiaceae) : Citrus aurantium (Rutaceae).

Cirina forda Westw. — Ozoroa mucronata (Anacardiaceae) : Carissa (Apocynaceae) : Erythrophloeum guineense (Caesalpiniaceae) : Warburgia (Canellaceae) : Casuarina (Casaurinaceae) : Manilkara zaporta, Butyrospermum parkii, Sideroxylon diospyroides (Sapotaceae).

Urota sinope Westw. — Eucalyptus (Myrtaceae) : Erythrina abyssinica (Papilionaceae).

Gynanisa maia Klug — Acracia mearnsii. Mimosaceae).

Athletes ethra Westw. — Eucalyptus (Myrtaceae).

„ *semialba* South — Brachystegia, Cassia (Caesalpiniaceae).

„ *steindachneri* Rebel — Acacia xanthophloea (Mimosaceae).

Pselaphelia flavivitta Wlk. — Trichilia roka (Meliaceae).

„ *apollinaris* Bsd. — Turraea nilotica, Turraea sp. (Meliaceae) : Pinhey also states 'probably on Combretus (Combretaceae)'.

Decachorda aspersa Beauv. — Grasses generally (Gramineae).

Tagoropsis flavinata Wlk. — Allophylus africanus (Sapindaceae).

Usta terpsichore Mass & Weym. — Schinus molle, Sclerocarya caffra (Anacardiaceae) : Commiphora (Burseraceae).

Micragone ansorgei Roths. — Brachystegia (Caesalpiniaceae).

Ludiinae

Holocera smilax Ang. — Spathodea campanulata (Bignoniaceae) : Sapium ellipticum (Euphorbiaceae) : Jasminum (Oleaceae).

„ *angulata* Auriv. — Combretum (Combretaceae) : Sapium (Euphorbiaceae) : Samanea (Mimosaceae) : Ficus capensis, F. eriobotryoides (Moraceae) : Maesa lanceolata (Myrsinaceae).

Ludia dentata Hamps. — Vernonia (Compositae).

„ *arguta* Jord. — Vernonia (Compositae).

„ *hansali* Feld. — Tarchonanthus camphoratus (Compositae).

„ *delagorguei* Bsd. — Microglossa, Senecio (Compositae).

„ *orinoptena* Karsch — Cynara, Erlangea tomentosa, Gynura, Laggera alata (Compositae): Hoslundia, Iboza multiflora (Labiatae).

Goodia kuntzei Dew. — Berlinia (Caesalpiniaceae) : Millettia (Papilionaceae) : Deinbollia (Sapindaceae).

„ *oxytela* Jord. — Afromomum sp. (Zingiberaceae).

BRAHMAEIDAE

Dactylocera lucina Drury — Harungana madagascariensis (Hypericaceae).

SPHINGIDAE

Acherontiinae

Herse convolvuli L. — Helianthus (Compositae) : Convolvulus, Ipomoea, Stictocardia (Convolvulaceae) : Bambusa (Gramineae) : Arachis, Dolichos, Phaseolus (Papilionaceae) : In west Africa on Newbouldia laevis (Bignoniaceae) : Dissotis rotundifolia (Melastomaceae). Le Pelley's record of Bambusa seems very doubtful.

Acherontia atropos L. — Bignonia, Millingtonia hortensis, Spathodea, Tecoma, Tecomaria (Bignoniaceae) : Ipomoea batatas (Convolvulaceae) : Hoslundia, Pogostemon cablin, Salvia (Labiatae) : Glossypium (Malvaceae) : Jasminum, Schrebera alata (Oleaceae) : Sesamun indicum (Pedaliaceae) : Datura, Physalis, Solanum, Withania (Solanaceae) : Clerodendrum, Duranta, Lantana, Verbena (Verbenaceae). In South Africa on Podranea brycei (Bignoniaceae) : Olea sp., Ligustrum sp. (Oleaceae) : Lyceum austrinum, Nicotiana glauca (Solanaceae).

Coelonia mauritii Btlr. — Acanthus (Acanthaceae) : Cissus (Ampelidaceae) : Bignonia, Markhamia platycalyx, Millingtonia hortensis, Spathodea, Tecoma, Tecomaria (Bignoniaceae) : Cordia (Boraginaceae) : Dahlia (Compositae) : Convolvulus, Ipomoea (Convolvulaceae) : Coleus, Pycnostachys, Salvia (Labiatae) : Buddleia, Lachnopylis (Loganiaceae) : Jasminum (Oleaceae) : Lycopersicum, Nicotiana, Solanum (Solanaceae) : Clerodendrum, Duranta, Lantana (Verbenaceae).

„ *solani* Bsd. — Ricinus (Euphorbiaceae).

Xanthopan morgani Wlk. — Annona, Uvaria (Anonaceae) : Michelia champaca (Magnoliaceae).

Macropoliana natalensis Btlr. — Markhamia platycalyx (Bignoniaceae) : Brachystegia (Caesalphiniaceae) : Olea africana (Oleaceae). N.B. Le Pelley's record of Markhamia almost certainly refers to the next species, which has just been separated.

„ *oheffernani* Gess — Spathodea (Bignonioceae) : Olea africana (Oleaceae).

Dovania poecila Roths. & Jord. — Acanthus arboreus (Acanthaceae).

Praedora leucophaea Roths. & Jord. — Clerodendrum (Verbenaceae).

Ambulicinae

Batocnema africana Dist. — Mangifera, Sclerocarya caffra (Anacardiaceae).

Pseudoclanis postica Wlk. — Loranthus (Loranthaceae) : Chlorophora, Ficus, Morus (Moraceae) : Celtis, Chaetacme, Trema (Ulmaceae). I am very doubtful of Pinhey's record of Loranthus. Alchornea cordifolia (Euphorbiaceae) : Psychotria (Rubiaceae).

Platypsphinx stigmatica Mab. — Craibia, Millettia, Mundulea, Xero stuhlmannii (Papilionaceae).

„ *constrigilis* Wlk. — Anthonotha macrophylea (Caesalpiniaceae) : Alchornea cordifolia (Euphorbiaceae). (In West Africa).

„ *stigmatica* Mab. — Millettia, Mundulea, Xeroderris stuhlmannii, Pterocarpus angolensis (Papilionaceae). (In West Africa).

Leptoclanis pulchra Roths & Jord. — Morus (Moraceae) : Eriosema (Papilionaceae).

Leucophlebia afra Karsch — Grasses (Gramineae).

Polyptychoides grayi Wlk. — Cordia (Boraginaceae) : Celtis (Ulmaceae).

Neopolytychus serrator Jord. — Julbernardia (Caesalpiniaceae) : Maesopsis eminii (Rhamnaceae).

„ *compar* Roths. & Jord. — Brachystegia (Caesalpiniaceae).

Falcatula falcata Roths. & Jord. — Sclerocarya caffra (Anacardiaceae) : Erythrina (Papilionaceae).

Polyptychus coryndoni Roths. & Jord. — Morus (Moraceae) : Parinari (Rosaceae).

„ *baxteri* Roths. & Jord. — Thespesia (Malvaceae).

Andriasa contraria Wlk. — Markhamia platycalyx, Spathodea, Newbouldia imperialis (Bignoniaceae).

Likoma apicalis Roths. & Jord. — Thespesia (Malvaceae).

Lophostethus demolini Angas — Carissa (Apocynaceae) : Adansonia (Bombacaceae) : Hibiscus (Malvaceae) : Dombeya (Sterculiaceae) : Grewia (Tiliaceae).

„ *demolini* Angas — Millettia aboensis (Papilionaceae) : Ficus (Moraceae). (In West Africa).

Acanthosphinx gussfeldt Dew. — Bridelia micrantha (Euphorbiaceae).

Rufoclanis rosea Druce — Urena lobata (Malvaceae). (In West Africa).

Rhadinopasa hornimani Druce — Spondias mombin (Anacardiaceae) : Millettia aboensis (Papilionaceae).

(to be continued) D. G. Sevastopulo.

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A.E.S. Conservation Group

1976 resolutions for those wanting to help conserve our insect fauna.

1. Strengthen the cause of insect conservation by joining our Group (see Where to Write panel in this Bulletin).
2. If you are already on our list, please remember that you will stop receiving Group Bulletins if you have not paid your subscription this year. Minimum subscription is 20p for A.E.S. members and 50p for other individuals and bodies. 1975 late payments welcome.
3. Join your local Naturalist Trust and help to ensure that insects receive the attention they merit in Wild Life Conservation.
4. Become our representative for your area. No specialised knowledge is necessary. Please write to D. Lonsdale for details.

ANNUAL EXHIBITION 1976

The usual venue, Holland Park School, is no longer available for our Exhibition but we have been very fortunate in finding an attractive alternative. The A.E.S. Annual Exhibition will now be held at

UNIVERSITY COLLEGE SCHOOL

HAMPSTEAD, LONDON, N.W.3.

on

SATURDAY, 2nd OCTOBER 1976

The facilities here are very good and a detailed map will be published in the August Bulletin. Briefly the School is just off the Finchley Road.

Walking times are 7 minutes from Finchley Road Station (Met. and Bakerloo), 5 minutes from Hampstead Station (Northern) and 3 minutes from Finchley Road and Frognal (British Rail, North London Line).

Buses are frequent along the Finchley Road and the stop is Arkwright Road.

Motorists are 1 minute from Finchley Road, 5 miles from Charing Cross, 4 miles from end of M.1. (entering London on A.41) and 3 miles from end of M.40.
Map reference is 263854.

VOL. 35 No. 312

AUGUST 1976

THE BULLETIN OF THE AMATEUR ENTOMOLOGISTS' SOCIETY

WORLD LIST ABBREVIATION:
BULL AMAT ENT SOC

EDITOR:
BRIAN GARDINER FRES

The Amateur Entomologists' Society

(Founded in 1935)

President	B. A. COOPER	Entomological Dept., Shardlow Hall, Shardlow Derby.
Hon. General Secretary :	P. A. SOKOLOFF	4, Steep Close, Orpington, Kent. BR6 6DS.
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Hon. Treasurer :	N. H. COOKE	8 Gerard Road, Barnes, London, SW13 9RG.

where to write

Advertisers and for Prospectus of Society and Application forms to :	R. D. HILLIARD, 18 Golf Close, Stanmore, Middlesex, HA7 2PP. 01-954 0460.
Manuscripts, drawings and books for review to :	B. O. C. GARDINER Address as above.
Changes of address and non-arrival of Bulletins to :	P. W. CRIBB Address as above.
Annual Exhibition matters to :	B. F. SKINNER, 85 Elder Road, West Norwood, London, SE27 9NB.
Membership applications and first subscriptions to :	D. KEEN, 3 Woodbourne, Farnham, Surrey, GU9 9EF.
Subscription renewals £2.00 per annum, £1.25 under 18 years to :	B. R. STALLWOOD, 7 Markall Close, Cheriton, Alresford, Hants. SO24 0QF.
A.E.S. Conservation Group :	D. LONSDALE, 25 Manor Road, Stoke Newington, London, N16 5BQ.
A.E.S. Exotic Insects Group :	C. J. ESCHBACHER, 38 Frith Road, Bognor Regis, Sussex, PO21 5LL.
A.E.S. Insect Behaviour and and Ants Study Group :	M. J. PARSONS, Hurst Lodge, Hurst Lane, Egham, Surrey.

AES BULLETIN No. 312

EDITORIAL

With luck this our August issue will appear early in the month before many of our members depart on holiday. While on holiday, bear in mind our Annual Exhibition to be held in September and use the opportunity to start catching the exhibit you are going to bring to our new venue in Hampstead—see map on back cover. All Junior members reading this are reminded that valuable prizes are awarded each year to the most meritorious exhibits by Junior members. As previously, we hope to publish a photo of the exhibit awarded first prize.

When Entomological journals were issued on a weekly basis, back in the 1850's and it took 2–3 days to edit and print, notices of times of emergence and the arrival of migrants really were topical and could be acted upon. Today most of our Journals are quarterly; there is one monthly left and indeed there is still a fortnightly one issued in Germany. It now takes at least 3–4 months to produce our quarterly Bulletins and it is therefore quite impossible to publish really topical items. Nevertheless records are records and, whatever time they be published, notes and observations of times of emergence and of migrations arriving, are of permanent interest since, taken over the years, when they come to be assessed by future generations, they may well show definite cyclical changes of great importance to the understanding of the cycles of life on this planet and while much information of this kind is perhaps being sent direct to a central source, the Biological Records Centre, it then becomes, so to speak, buried in the computer, not to surface until years later. We feel that many of our members would like to read about it sooner.

ANNUAL REPORT OF THE COUNCIL FOR 1975

The Council is pleased to report that the Society had another successful year. On the 31st December, 1975, the Society had 1,276 members, which is an increase of almost fifty per cent in the last five years. Council met six times during the year and the three Council Committees, including the newly formed Conservation Committee, met on several occasions.

Four Bulletins were produced under the editorship of Mr. B. O. C. Gardiner. They were of a high standard and have included photographic illustrations as a regular feature for the first time which Council feels has added greatly to its appeal. The cover of the Bulletin has been basically the same for the last 30 years and Council decided that a change would be welcomed. Mr. Shearer has designed a new cover and the results of his work appeared on the first issue of 1976.

The second edition of the Coleopterists Handbook was published in 1975. Publishing handbooks is now very expensive and Council hope that members will support the Society by purchasing our publications. Sales of AES publications have continued to be satisfactory and thanks are once again due to Mr. Christie for his continuing assistance as our publications agent.

Despite very heavy increases in postage and printing costs the Society finished with a small surplus on the Income and Expenditure Account. However, the Council decided that with costs rising so quickly an increase in subscription rates for 1976 was essential. The increases are modest and the subscription still represents excellent value for money. The Treasurer will report more fully on the Society's finances in his report.

The AGM was held in March at the Linnean Society in London and was presided over by Mr. Keen. It was preceded by an illustrated talk given by Mr. Wilkinson on the insects and plants of Thursley Common.

The Annual Exhibition was again held at Holland Park School and was very successful with a large attendance. Three Junior Prizes were awarded and a report of the exhibition appeared in the February Bulletin. The Society will be unable to hold the 1976 exhibition at Holland Park School and a new site has been found. The AES Annual Exhibition 1976 will be held at University College School, Hampstead, on 2nd October.

The three AES Groups have had a good year. The most popular, the Exotic Entomology Group, had another excellent year producing a large and entertaining newsletter. The EEG finished the year with over 100 members and another 50 non-AES subscribers. The Conservation Group continued to produce its newsletter and again organised several field trips. The Insect Behaviour and Ant Study Group produced several issues of its illustrated newsletter.

During the year Mr. Ollevant resigned as Youth Secretary and Dr. Boswell resigned from Council. The Council records its thanks to both for their past services to the Society.

J. Roche
Honorary Secretary

ANNUAL REPORT OF THE TREASURER FOR 1975

I am pleased to report that the Society has survived a year of record inflation during which steps have been taken to safeguard its general financial strength.

The effects of the 1975 economic climate are reflected in the Society's Income and Expenditure Account. Total income rose by 18% to £2,297 but total expenditure rose twice as fast, by 39% to £2,246; the marginal surplus income has fortunately increased by an adjustment to earlier tax provisions, to £113. Considering the Society suffered an increase of 42%

INCOME AND EXPENDITURE ACCOUNT
Year ended 31st December, 1975

EXPENDITURE				INCOME			
1974			1975	*1974*			1975
£			£	£			£
	Printing Costs:				Subscriptions:		
918	Bulletins	... ...	1305		866 Ordinary		
72	Indices	... ...	—	*1178*	(1974: 785)	...	1299
66	Membership Lists	...	70	*197*	259 Junior (1974: 246)		207
					27 Affiliated		
1056			1375	*37*	(1974: 25)	...	40
134	Stationery & Notices	...	212	—	Life membership income		2
306	Postage & Distribution		517				
30	Meeting expenses	...	39	*1412*			1548
12	Wants & Exchange Lists		17	*171*	Donations	... ...	237
20	Grants to Study Groups		27	*50*	Advertising Income	...	110
10	Insurances	... ...	23		Sales of Badges, Tie		
5	Depreciation	... ...	8	*12*	Pins	... ...	23
	Legal Fees			*118*	Annual Exhibition (net)		216
10	(*less* Provision)	...	—		Investment Income and		
34	Sundry Expenses	...	28		Deposit Interest		
				185	(gross)	... ...	163
1617			2246	*1948*			2297
	Provision for Income				Provision for Income Tax		
48	Tax	... ...	—	—	no longer required	...	62
	Surplus Income to						
283	General Fund	...	113				
1948			2359	*1948*			2359

PUBLICATIONS TRADING ACCOUNT

	Printing and New			*836*	Gross Sales	... ...	827
104	Publications	...	1069	—	Translation fee	...	20
280	Selling Expenses	...	277	—	Stock increase	... ...	902
106	Stock decrease	...	—				
490			1346				
	Trading Surplus to						
346	Publications Fund	...	403				
836			1749	*836*			1749

REPORT OF THE AUDITORS TO THE MEMBERS OF THE AMATEUR ENTOMOLOGISTS' SOCIETY

We have examined the records of The Amateur Entomologists' Society and, in our oponion, the Balance Sheet gives a true and fair view of the statement of affairs on 31st December 1975 and of the Income and Expenditure for the year ended on that date.

L. G. WHITING, F.C.A.
A. C. WOOD, F.C.A.

19th March, 1976. *Honorary Auditors.*

THE AMATEUR ENTOMOLOGISTS' SOCIETY
BALANCE SHEET AT 31st DECEMBER, 1975
GENERAL FUND

1974 £	1974 £		1975 £	1975 £
	1940	**Balance of Fund:** 1st January	2223	
	283	Add: Surplus Income for year	113	
2223				2336
—		**Life Membership Fund** ...		42
128		**Sundry Provisions**		—
		Creditors:		
	381	Advance Subscriptions ...	719	
	43	Advance Donations ...	108	
	63	Sundries	27	
487				854
2838				3232

1974 £	1974 £		1975 £	1975 £
		Fixed Assets:		
	290	Office Equipment at cost...	318	
	(239)	Less: Depreciation to date	(247)	
51				71
		Investments at cost:		
	—	£1066.78 Treasury 9% Convertible 1980 ...	984	
	—	£561.01 Treasury 8½% 1980/82	500	
	—	£45.61 Treasury 12¾% 1995	40	
—				1524
		Current Assets:		
	143	Stocks at Cost	112	
	76	Sundry Debtors	184	
	—	Income Tax Recoverable...	25	
		Cash at Bank:		
	2000	Deposit 650		
	568	Current 666		
			1316	
2787				1637
2838				3232

A.E.S. STUDIES GROUP FUND

	Balance of Fund: 31st Dec....		112	**Current Assets:**	
	Sundry Creditors		13	Cash at Banks	125
			125		125

PUBLICATIONS FUND

3185	**Balance of Fund:** 1st January	3720			**Investment:**		
	Add: Trading Surplus for				Halifax Building Society		
346	year	402		*2343*	Deposit		—
	Building Society Deposit				**Current Assets:**		
189	Interest	145			Stocks of Publications at		
3720			4267	*1176*	lower of cost or valuation	2078	
279	**Creditors**		275	*427*	Sundry Debtors	322	
					Cash at Bank:		
				—	Deposit	2070	
				53	Current	72	
						2142	
				1656			4542
3999			4542	*3999*			4542
6837			7899	*6837*			7899

N. H. COOKE,
President and Hon. Treasurer.

in the cost of printing and stationery, and 70% in postages, even this result was creditable and perhaps it may have been due to the rise in income from donations, up to £237, and advertising and Exhibition revenue, which doubled to £110 and £215 respectively. The increase in subscription income to £1,548 was disappointing given the continuing record influx of members to the Society during the year, and shows the necessity of the Council's decision in May to raise subscription rates to £2.00 p.a. (£1.25 for Juniors) as from 1976. It remains vital that subscription income should cover much, if not all, of general expenditure in order to leave other sources of income to build up the Society's reserves.

The publication Trading Account reflects a successful, if unexciting year, the trading surplus of £403 being higher than in 1974; turnover was slightly lower in spite of a marked increase in the sale of old Bulletins. The second edition of the "Coleopterist's Handbook", printed at a cost of £1,069, will not bring in sales revenue until 1976 but the Publications Fund closed the year with at least £2,000 available to complete the current publications programme. This includes two new Handbooks and three re-published leaflets, and provided revenue is sufficient these should be printed in the next eighteen months.

The Society's Balance Sheet reflects several developments mentioned in my last Report. The General Fund now incorporates Government stocks, acquired during 1975 in the names of the two Trustees, which will stabilise the Society's reserves and provide a small amount of capital growth over the next few years. The General Fund also includes a new Life Membership Fund, and the corresponding investment of the first £40 life membership payment under the revised terms laid down by the Council under the Society's Rules. I hope other members will decide to take advantage of these terms.

The new AES Study Groups Fund records the combined financial strength of the three Groups which are eligible for support grants from the Society. Of these the Conservation and Exotic Entomology Groups remained financially sound during 1975 and in 1976 the Society is providing £40 to ensure that all three Groups survive and prosper.

Charitable status has begun to benefit the Society through the exemption from tax of bank deposit interest and investment income. As already mentioned, previous tax provisions totalling £62 were waived by the Inland Revenue and the tax saving on 1975 income amounted to nearly £90—an overall saving of over £150 in the year.

Propects for 1976 are encouraging. I must thank the record number of members who have already renewed their subscriptions at the higher rates, and particularly the 200 members who now subscribe by Bankers' Order. Several individual members have given particularly generous donations. Provided the rate of inflation continues to fall, the Society

should be well placed to afford those refinements to its administrators which its continued growth will necessitate.

N. H. Cooke
Honorary Treasurer

AES EXOTIC ENTOMOLOGY GROUP REPORT 1975

1975 proved to be an extremely hectic year, starting with the resignation due to ill-health of our Editor, Dave Moon. Therefore, in May I found myself with the extra duties of Editor and newsletter distributor with still one issue to complete the 1974 series. I was able to complete and distribute this in June, which left six months to chase up renewals and publish four 1975 newsletters. The first was sent out in July, the second in September, the third in October and the last in December.

A total of 130 A4 pages of news, articles and illustrations contributed by members were published in 1975, and in the last newsletter a popular innovation was the page of black and white photographs which were also sent in by Group members. This was made possible through the kind help of Robert Goodden of Worldwide Butterflies Ltd. Four such pages are planned for 1976.

The year closed with 111 members and 50 subscribers and the trend for our subscribers to join the AES continued.

The AES Exhibition saw an excellent turn-out of members and it was unanimously agreed that it was our finest effort yet. With only one exception, all displays on the EEG stand were "live" and proved a great attraction.

Financially the EEG is in a sound position having made a surplus for 1975 of £3.34 and we have not, therefore, had to ask the AES for additional financial assistance. Keeping membership/subscription fees at the 1975 level, we expect to do as well in 1976.

An EEG meeting was arranged for Saturday, 22nd May, at Worldwide Butterflies Ltd., where facilities are available for Group members to converse at length, something which we find difficult amidst the bustle and rush of the AES Exhibition!

C. J. Eschbacher

THE INFLUENCE OF THE WEATHER ON THE ACTIVITY OF MOTHS DURING THE NIGHT

Introduction

Mohamed Kazanini, writing in the "Book of the Marvels of Nature and the Singularities of Created Things" in the first half of the thirteenth century, states that the Khalif de Samarkande on one night collected round the lamp a measure called Macouc (drinking cup) of moths and, on dividing them, counted seventy-three kinds (in Williams, 1964). But

it was not until the 1950's that the mercury vapour light trap was patented (Robinson & Robinson, 1950; Robinson, 1951) and has since been used extensively for collecting and studying moths (see Heath, 1970a for details). It has been noticed that there are "good" and "bad" nights for moth captures, the former being generally warm and humid, especially thundery nights with little wind, rain or moonshine; "bad" nights, on the other hand, tend to be cold, clear and moonlit, often with wind and rain. This investigation involves the use of a light trap to sample a moth population in an attempt to determine the major meteorological factors which affect the activity of moths during the night. It is expected that there will be a positive correlation between the number of moths caught (the catch) and temperature, pressure, humidity and cloud cover; and a negative correlation between the catch and wind speed, rain and moonlight.

A Robinson-type trap with a 125 watt "pearl" U.V. bulb was operated in a small garden in Little Chalfont, Buckinghamshire which stands 440 feet (134 metres) above sea level on the crest of a chalk ridge in the Chiltern Hills. The climate is typically North-West European type and the natural vegetation was mixed woodland, now replaced by gardens, Beech (*Fagus sylvatica*) woodlands with Wild Cherry (*Prunus avium*) and Holly (*Ilex aquifolium*) undergrowth, mixed farmland and Forestry Commission conifer with Birch (*Betula verrucosa*) plantations.

Previous work on the subject has mainly been done at Rothamstead, Hertfordshire by Williams (1939, 1940), Taylor (1963), Taylor & Carter (1961) and Pinchin & Anderson (1936). Williams (1940) has shown that the "catch" is a sample of the total population of moths in the area and is proportional to the population times the activity:—

$$\text{Catch} \propto \text{Population X Activity}$$

The catch includes only positively phototrophic moths that are active; activity (total) equals the activity due to temperature times activity due to wind times activity due to humidity etc. thus:—

A_{total} (Activity total) = A_t (Activity due to temperature)
X A_w (Activity due to wind) X A_{rh} (Activity due to relative humidity) etc.

$\therefore$ Catch $\propto$ (A_t X A_w X A_{rh} etc.) X Population

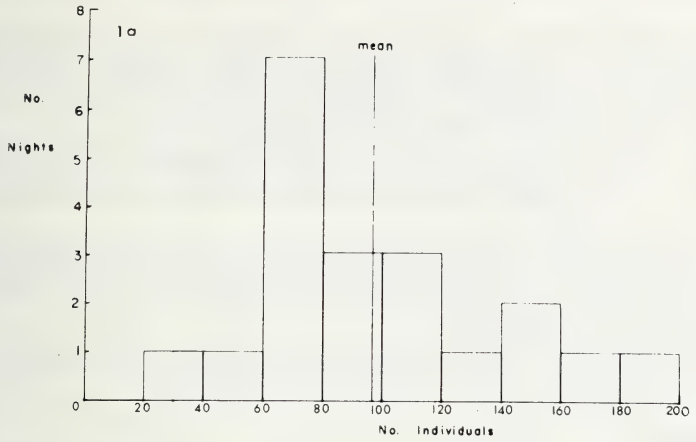
$\therefore$ log. Catch = (log. A_t + log. A_w + log. A_{rh} etc.) + log. Population

The reason for the use of logarithms is discussed later.

Broadly speaking, climate affects moths (as well as other organisms) in four intensities:—

FIG. 1. Frequency distribution of catches expressed as (a) numbers, and (b) logarithms.

FIG. 2. Frequency distribution of number of individuals per species captured (total).


1a
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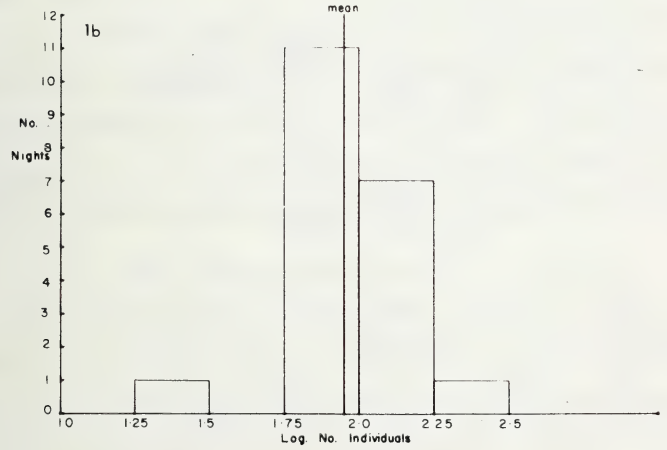
180
200
No. Individuals


1b
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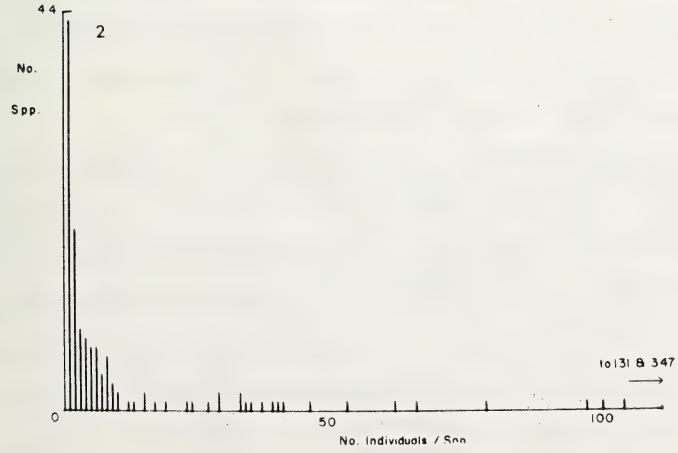

2
44
No.
Spp.
to 131 & 347
0
50
100
No. Individuals / Spp

1. Mega-scale changes caused by plate tectonics and the movement of land masses on the Earth giving rise to major climatic changes, also ice advances and other catastrophes, which cause speciation, evolution and extinction. These are difficult to measure.
2. Macro-scale climatic effects, i.e. seasonal changes occurring mainly on an annual scale causing population changes, measurable over a number of years.
3. The small-scale changes with which this study is concerned, i.e. day-to-day changes of weather (meteorological effects) which affect the activity of the population.
4. Micro-climatic effects, gusts of wind, cloudbursts, etc., which can be regarded as errors when studying type 3 changes.

Methods

The trap was operated on alternate nights from 2100 hrs to 0800 hrs during July and August 1974 for twenty nights, starting on the 1st of July, and ending on August the 8th. The intervening nights allowed the moths to disperse in the area to prevent erroneous recaptures. It is thought that, owing to the enclosed nature of the site, the captures were mainly of moths flying into the lighted area, i.e. the garden. Pieces of egg-packaging trays were placed in the trap to allow those captured to settle out of the light to prevent damage and aid sorting and identification.

Each individual was identified using South (1961), but for difficult species Kirby (undated) which contains useful descriptions, Tykacz (1963) was used for its photographs and also Ansorge (1969) and Heath (1969, 1970b, 1971a&b, 1972). Only the "Macrolepidoptera" were identified and counted. The Uncertain (*Caradrina alsines* Brahm.) and the Rustic (*C. blanda* Schiff.) were inseparable without a genitalia examination and are therefore included as one species. Therefore the number of individuals, number of individuals per species and number of species on each night was found. The Heart & Dart (*Agrotis exclamationis* Linn.), a typical and abundant member of the Noctuidae, was separated into sexes. After sorting, the moths were released.

The meteorological factors investigated were: temperature, humidity, pressure, rainfall, wind, cloud, moonlight and visibility. A makeshift Stevenson screen was erected on an outbuilding overlooking the trap, which contained a maximum/minimum thermometer and an unventilated wet & dry bulb hygrometer, both calibrated in degrees Celsius; an aneroid barometer calibrated in inches of mercury ("Hg) was sited in a wooden shed and it was not necessary to correct the instrument for altitude difference; rainfall was measured in a gauge placed on the lawn and consisted of a 3 inch diameter plastic funnel placed in a Kilner jar; wind speed and direction were recorded on a continuous recording anemo-

graph situated in "The Radiochemical Centre", the anemometer and windvane were actually sited on a tower approximately 20 metres high and 400 metres from the trap, the recorder was calibrated in knots and compass points. Other factors were recorded on arbitrary scales. Readings were taken at 2100 hrs, 2400 hrs and 0800 hrs during the night, specifically the data as shown in Table 1 were recorded.

The results were analysed using graphs and the statistical methods of correlation, regression and multiple regression. Using correlation and regression analysis the degree of correlation between the biological (dependent) variable and the meteorological (independent) variable can be found, and also the amount and direction of the effect which the weather factor is producing can be assessed. Using multiple regression analysis the interrelations of the various independent variables can be analysed.

TABLE 1

PHYSICAL DATA RECORDED

	Instrument	Scale
1. TEMPERATURE		
(a) Ambient	hygrometer—dry bulb	°C
(b) Wet bulb	hygrometer—wet bulb	°C
(c) Maximum*	max./min. thermometer	°C
(d) Minimum*	max./min. thermometer	°C
* Not recorded at 2100 hrs.		
2. PRESSURE		
(a) Actual	barometer	"Hg
(b) Direction	barometer	steady/rise/fall
3. HUMIDITY		
Calculated from tables in HMSO MO265B (Anon., 1961) using ambient and wet bulb temperature readings; relative humidity (%), vapour pressure (mb.) and dew-point temperature (°C) were recorded.		
4. RAINFALL		
Zero was recorded on every occasion.		
5. WIND		
(a) Speed	anemograph	knots
(b) Direction	anemograph	compass points
6. CLOUD		
(a) Amount	visual assessment	sky cover $\frac{1}{8}$ths
(b) Type	visual assessment	—
7. MOONLIGHT		
Zero was recorded on every occasion.		
8. VISIBILITY	visual assessment	m./km.
Only 1, 2a, 3rh, 5 and 6a were actually used in the final analysis.		

It was found that the frequency distribution of the catches was positively skewed and therefore a transformation of the data was required before reliable statistical tests could be applied (see Fig. 1). It has been shown (Williams, 1939, 1940) that the changes which take place in the

catches are of a geometric nature; i.e. a catch of twice the mean is as likely to occur as one of half the mean, one of four times the mean is as likely to occur as one of a quarter of the mean, and so on; therefore a logarithmic transformation should be used, and has been in this investigation. Similarly the frequency distribution of numbers of individuals per species is also, excessively, positively skewed (Poisson distribution—see Fig. 2). The effect of a transformation is to give a straight line regression rather than a curvi-linear one, for example in the correlation between number of individuals and number of species (Figs. 3 & 4).

When analysing the effect of weather conditions on the number of species captured the actual number cannot be used due to this strong correlation (e.g. if only 30 individuals are captured, as on the 4th of August, then the number of species cannot exceed this figure) so an index of the diversity of the population sample is used, taking into account the logarithmic distribution of numbers of individuals (Williams, 1944, 1945; Fisher, Corbett & Williams, 1943). The index of diversity (α) can be read directly from a table, such as that in Lewis & Taylor (1967). It should be noted that the index has a logarithmic series involved and also requires transformation if used in statistical analyses.

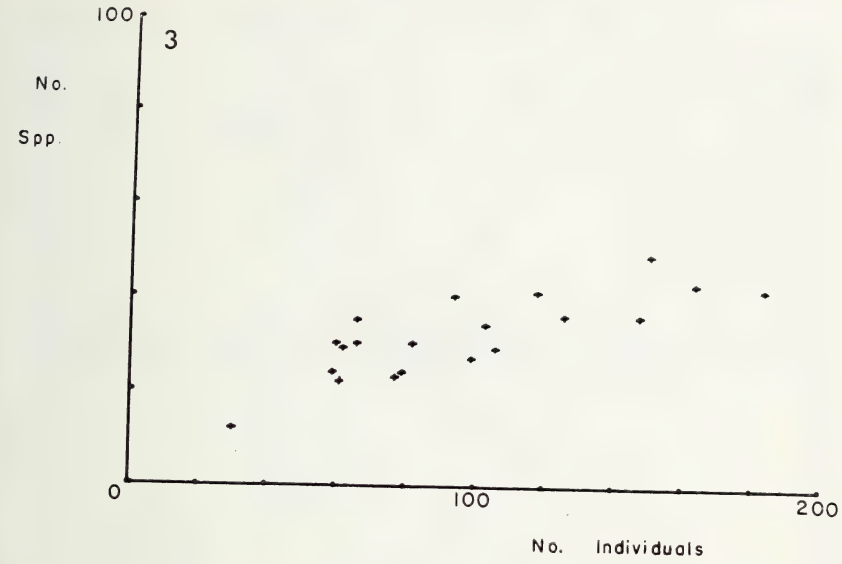
The sources of error are numerous, as in any field investigation, and consist mainly of four types:

(1) Trap errors—the light attracts only positively phototropic insects and some species of moth are not attracted to light very much (e.g. The Mouse, *Amphipyra tragopoginis* Clerck, of which none of this common moth were caught) whereas some are attracted much more than others (up to 5,000 times, see Taylor & Carter 1961), also another attractant may be more inviting, such as flowers, or another light.

(2) Activity errors—escapes from the trap, usually due to the early morning sun causing the trap to warm up, members of the Geometridae tend to escape more easily than the larger species; population fluctuations are compensated for partly by this study having been done during the summer when a fairly constant number of species is on the wing; the activity of predators will also be affected by environmental factors; some species tend to fly at greater heights from ground level than others and are less likely to be attracted; throughout the trapping period there would have been a change in the times of dusk and dawn, thus the night would have been lengthening over the period.

(3) Instrumental error—distance from the trap of the wind recorder may be significant; intrinsic instrument errors; the small number of observations; statistical errors of tables and non-normality of sample, etc.

(4) Human error—intrinsic human error; factors not analysed which may also affect the activity; errors in calculation.



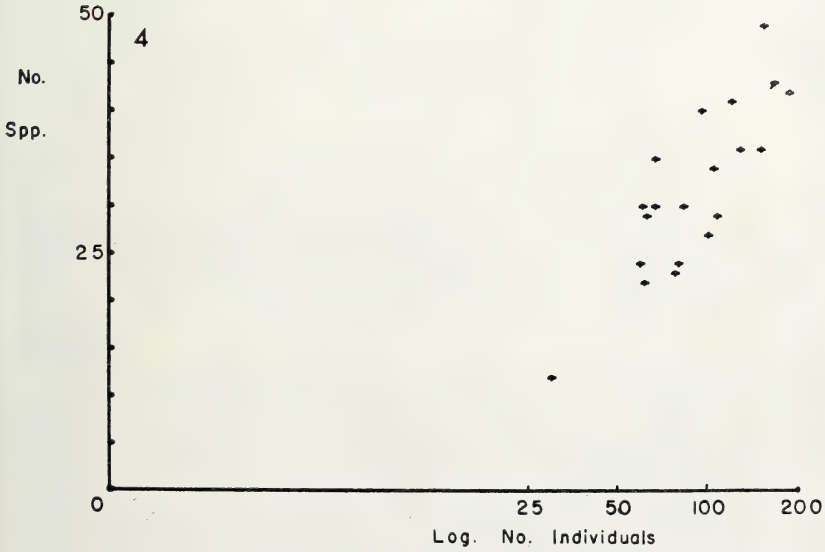


FIG. 3. Showing the curvilinear relationship between the number of species and the number of individuals captured.

FIG. 4. Figure 3 transformed to produce a more linear regression line.

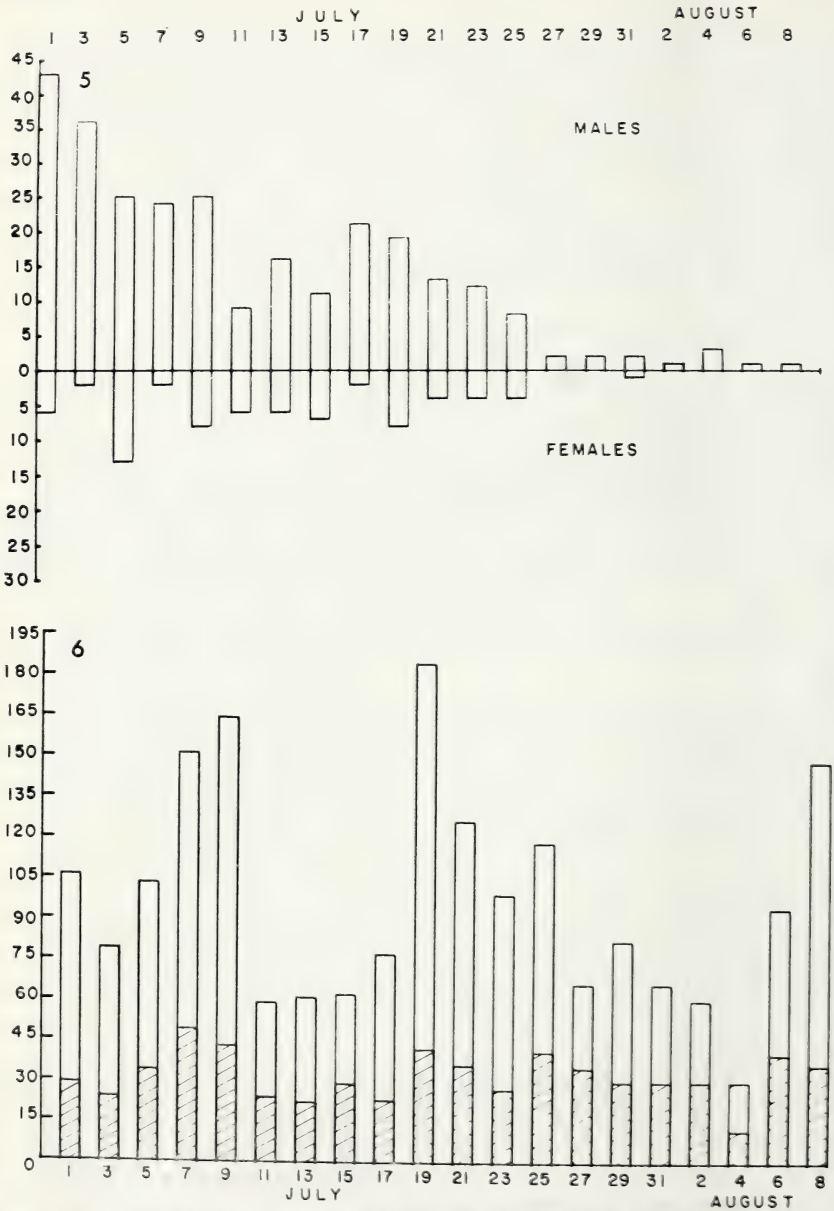


FIG. 5. Graph to show the actual numbers of males and females of *Agrotis exclamationis* (The Heart & Dart) captured on each night. The number of females captured was lower than the number of males on every night. Note also the total numbers declining as the season progressed.

FIG. 6. Histogram showing numbers of individuals (white) and species (shaded) captured on each night.

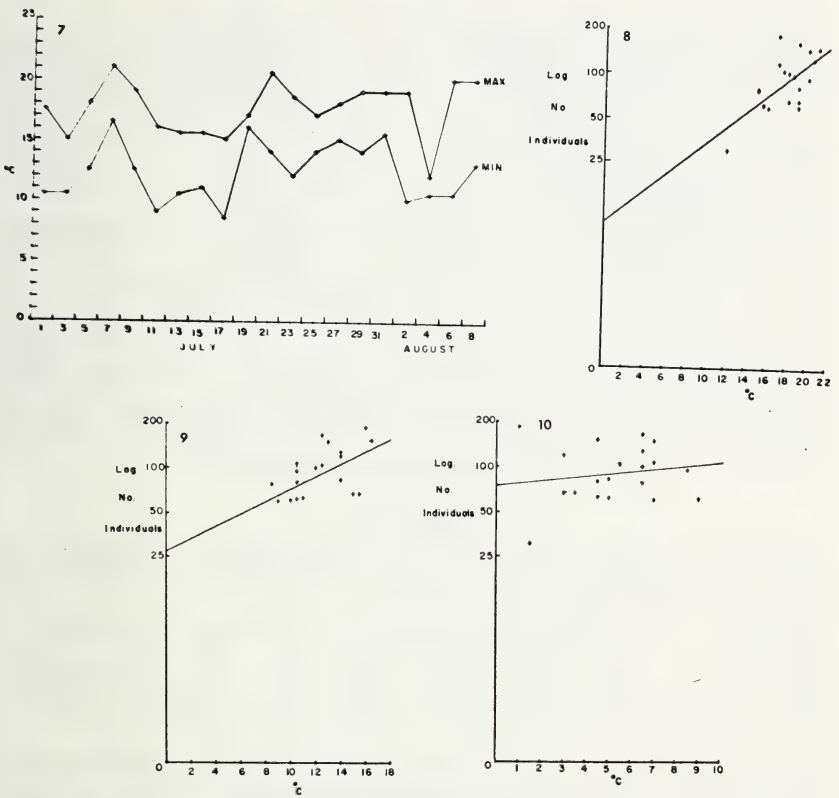


FIG. 7. Maximum and minimum temperatures recorded on each night.
FIG. 8. Regression of log. number of individuals on maximum temperature.
FIG. 9. Regression of log. number of individuals on minimum temperature.
FIG. 10. Regression of log. number of individuals on temperature range.

Results

Apart from meteorological factors, the relationship between individuals and species has been analysed, as described in connection with the logarithmic transformation; also it was noticed that there was a larger proportion of males than females captured and Fig. 5 is a graph of the sex ratio of *Agrotis exclamationis* Linn. Using Student's t-test, the difference was found to be highly significant, at the 0.1% level ($t=11.079$, 38 degrees of freedom, $p > 0.001$). Notice also that the number of females captured each night does not decline so sharply as the number of males does as the flight period tails off.

Temperature was found to be the most important single factor influencing the activity of moths. Fig. 6 shows the actual number of individuals and species captured on each occasion, and Fig. 7 shows the corresponding maximum and minimum temperatures, and therefore the difference

(range) of temperature. It will be seen that the highest maximum temperatures tend to correspond with large captures, and the lowest maximum, occurring on August the 4th, occurs on the night of the lowest catch (30 individuals). Large catches also occur when the minimum temperature is high. Note also that the smallest range of temperature occurs on the 19th of July when the largest catch was also recorded. Fig. 8 shows the positive correlation, and the calculated regression line, between numbers of individuals (log. scale) and maximum temperature. Fig. 9 shows the positive correlation, and regression line, between log. numbers of individuals and minimum temperature, the regression line is less steep than that of Fig. 8. Fig. 10 shows the correlation between log. numbers of individuals and temperature range, there is a slight negative correlation, but this was not calculated due to the correlation which probably exists between temperature range and maximum and minimum temperatures. Fig. 11 shows the correlation and regression line between log. index of diversity (α) and maximum temperature.

TABLE 2

Results of correlations and regressions and their significance (Student's t-test, p-values) performed on numbers of individuals, index of diversity and maximum and minimum temperature.

Dependent	Maximum Temperature				Minimum Temperature			
variable	Cor.	Sig.	Reg.	Sig.	Cor.	Sig.	Reg.	Sig.
log. no. indiv.	0.65	>0.01	0.055	>0.002	0.52	>0.02	0.042	>0.02
log. α	0.64	>0.01	0.037	>0.01	—	—	—	—

It can be seen from Table 2 that maximum temperature has more effect on the total catch than minimum temperature (there is a closer correlation and the regression line is steeper) and also affects the catch more than the diversity of the sample captured, but all are significantly affected.

The effect of pressure can be seen in Fig. 12. There is a positive correlation, however, it was suspected that this may have been due to the correlation between pressure and temperature, so partial regressions were calculated for the effect of these two variables on numbers of individuals and it was found that the partial regression of pressure on log. number of individuals was not significant if maximum temperature was held constant (see Table 3). A rise in pressure causes a rise in temperature (they are positively correlated) and it is the temperature rise which causes the rise in the catch.

It was expected that there would be a positive correlation between relative humidity and numbers of individuals but Fig. 13 shows the correlation to be negative, but there is not a close correlation. Humidity is likely to be closely affected by temperature, pressure and wind, so its effect would be difficult to determine.

TABLE 3

Regression co-efficient of pressure X number of individuals and partial regression co-efficients (P. Reg.) of pressure X number number of individuals, maximum temperature held constant, and maximum temperature X number of individuals, pressure held constant. The partial regression co-efficient for pressure X number of individuals, accounting for temperature, is not significant.

Dependent Variable	Pressure alone		Pressure and Maximum Temperature Multiple Regression			
	Reg.	Sig.	P. Reg.	Sig.	P. Reg.	Sig.
log. numbers individuals	0.359	>0.01	0.263	<0.1	0.052	>0.01

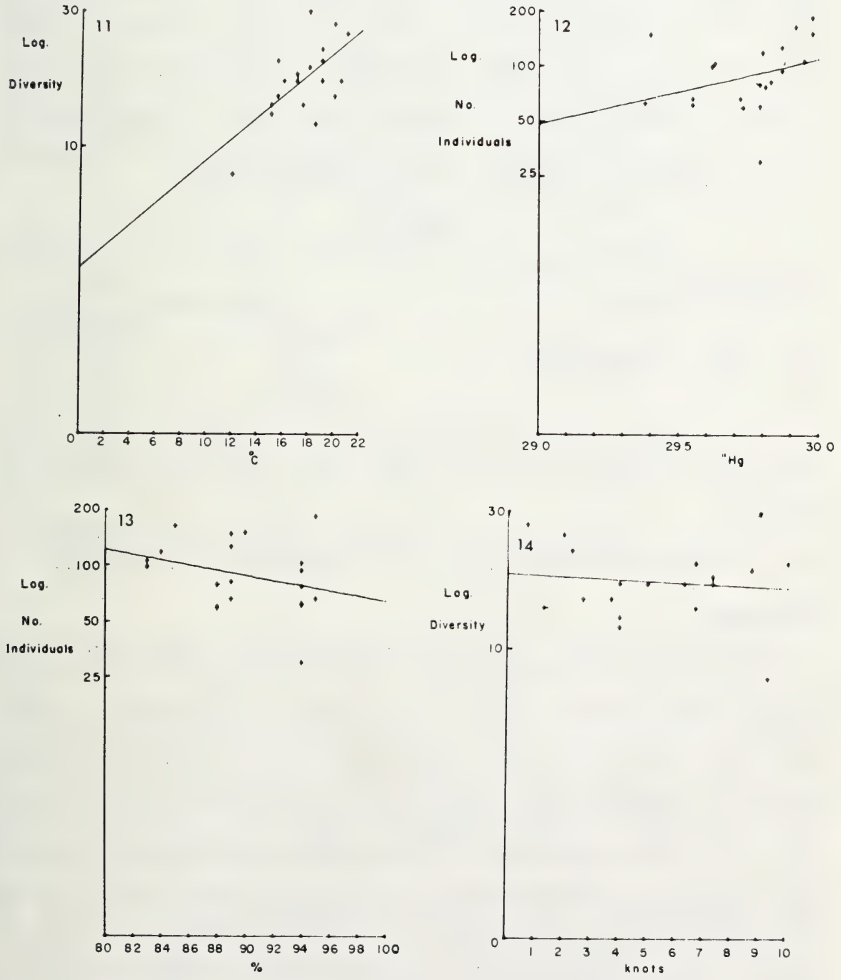


FIG. 11. Regression of log. diversity on maximum temperature.
FIG. 12. Regression of log. number of individuals on pressure.
FIG. 13. Regression of log. number of individuals on relative humidity.
FIG. 14. Regression of log. diversity on wind speed.

Wind speed should be negatively correlated with the size of the catch. It was thought, however, that there would be a difference in the catch itself between the numbers of the family Noctuidae, which tend to be large, strongly-flying species and therefore not much affected by the wind speed, and the Geometridae, which have large wings in relation to their bodies, and would be more likely to be blown by the wind and thus tend not to fly on windy nights. Firstly, the index of diversity was plotted against wind speed (Fig. 14) and there does seem to be a slight negative correlation. Figs. 15 and 16 show the correlation between Noctuidae and wind speed, and Geometridae and wind speed. The correlations are not very close, but both are negative; that for the Geometridae is steeper than that for the Noctuidae, but neither are significant, nor is the difference between them (Table 4). Student's t-test was again used. Wind direction is shown on Fig. 17 correlated with number of individuals, the wind mainly originating in the west, but there is a slight indication of lower catches with a northerly or north-westerly air-mass.

TABLE 4

Regression co-efficients of wind speed with number of Noctuidae, and number of Geometridae.

Dependent Variable	Wind Speed	
	Regression	Significance
log. number of Noctuidae	−0.013	<0.1
log. number of Geometridae	−0.035	<0.1
	Difference	<0.1

Cloud cover is correlated with numbers of individuals in Fig. 18 but there does not seem to be a very great effect. Cloud type could not be analysed.

Rainfall was recorded as zero on every night, as was moonlight (i.e. the moon was never visible in the sky). Visibility was not analysed.

Discussion

It was shown in Fig. 5 that a greater proportion of males than females of a typical Noctuid moth (*Agrotis exclamationis* Linn.) are attracted to the light trap. Williams (1939) also showed that there was a smaller percentage of females on nights when the insect is more abundant and the results in Fig. 5 seem to agree with this; he suggests that this is because the females are less sensitive to changes affecting the species as a whole, and that on "good" nights individuals (i.e. mainly males) are drawn from farther afield than on "bad" nights. It has also been suggested that females are usually engaged in laying eggs, and are therefore not so easily attracted until after they have accomplished this task. Judging by the number of females entering the trap in an almost pristine condition, easily as many as those which were imperfect, I would suggest that females fly not only after laying eggs, but also when freshly emerged and are in the process of mating or selecting a laying site; this could account

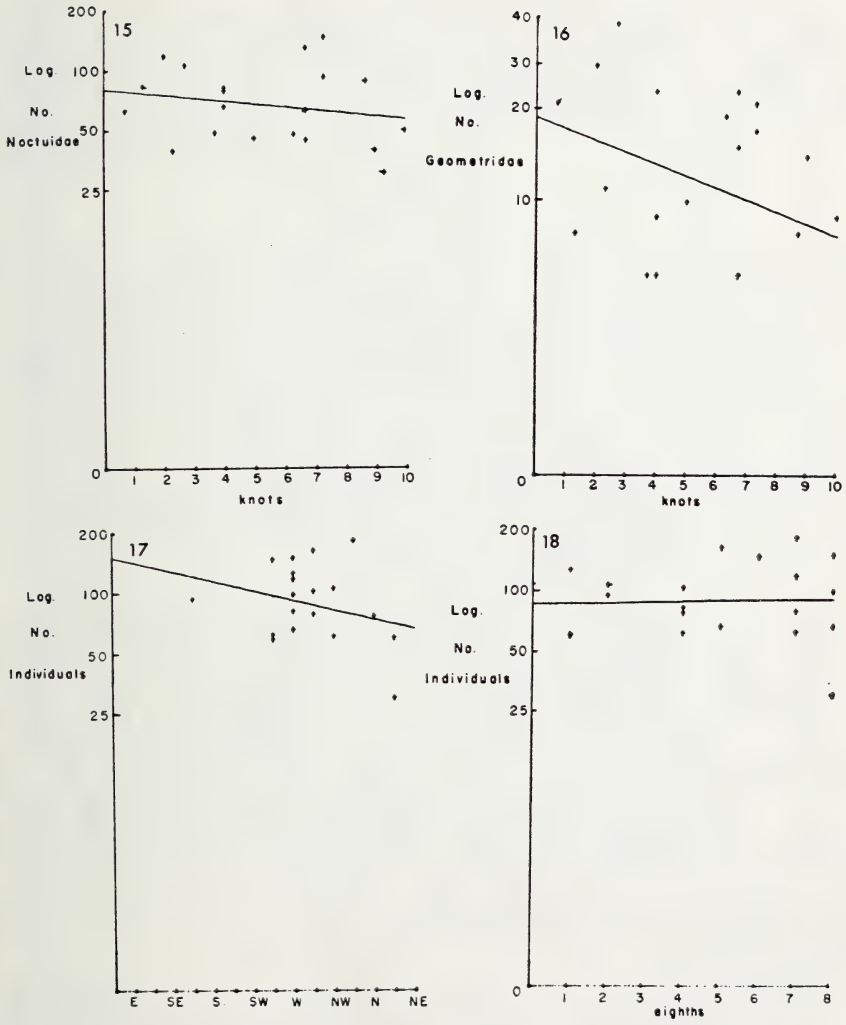


FIG. 15. Regression of log. number of Noctuidae on wind speed.
FIG. 16. Regression of log. number of Geometridae on wind speed.
FIG. 17. Regression of log. number of individuals on wind direction.
FIG. 18. Regression of log. number of individuals on cloud cover.

for the almost constant number of females caught compared to the strongly declining male population at the end of the flight period (Fig. 5).

Temperature was found to be the most important factor affecting the activity of moths, maximum temperature more so than minimum. Taylor (1963) has shown that insect flight is controlled by temperature thresholds, there being a lower threshold below which flight is inhibited, and an

upper one (rarely reached in temperate regions) above which activity decreases; between the two thresholds flight is uninhibited. These thresholds are species-specific, therefore in a mixed population, such as the one being studied, as the temperature rises, more and more species will become active as their lower thresholds are passed; the thresholds are, of course, not a single temperature point, but a short range. The temperature at night decreases gradually, as heat is lost to space, from dusk onwards to dawn. If the maximum temperature (the sunset temperature) at dusk is below the lower threshold of, say, 50 per cent of the species in the population, then there will be a subsequent reduction in the numbers, and species, available for capture. In this respect the number of individuals is a dependent variable. As the night progresses, more species will cease to fly as the temperature falls below their lower thresholds and it is well known that the number of species in flight after about midnight (when most thresholds are higher than the ambient temperature) is few and decreasing. The maximum (sunset) temperature is therefore more useful in determining the number of species and, therefore, the number of individuals active than the minimum temperature, as has been found, if this hypothesis is correct.

It is noteworthy that temperature is only found to be the most important factor in certain areas (temperate regions?) such as the British Isles. Williams (1939, 1940, Rothamstead and 1961, Scottish highlands) found that temperature was the most effective, but Cook (1923, Minnesota) found that humidity was most important when near to the seasonal normal, but when temperature and pressure were high, then the activity was greater when humidity was low; also Chernyshev & Bogush (1973, Turkmenistan) found temperature to be most important in April, but relative humidity to be more important from June onwards. Both Minnesota and Turkmenistan have continental climates where the temperature in the summer may always be above the thresholds, or would be constantly fairly high, and therefore other factors would seem to be more important.

A high temperature is obviously conducive to activity in poikilotherms, but it has been pointed out that the body temperature of a moth may be greater than the ambient temperature by perhaps 8° or 9°C. for large hawk moths (Sphingidae) (Taylor, 1963).

Pressure was found to be positively correlated with temperature and therefore its effect on activity is indirect, Cook (1923) also came to this conclusion.

Humidity showed very little correlation and a much larger sample is required, and probably the use of multiple regression analysis, to discover any trends.

Rainfall would influence the catch in various ways; by physically obstructing the moths in flights, by the necessary presence of cloud, and

by the reduction in visibility of the light, moths generally do not fly in heavy rain for the first reason. No night rain was recorded on any occasion, but Williams (1940) has analysed the effect of day rain, and found a lower catch on the nights following day rain, this, however, was due to a lowering of temperature caused by overcast sky and wet ground during the day.

TABLE 5

List of species recorded.

Sphingidae *Laothöe populi* Linn. *Deilephila elpenor* Linn. Notodontidae *Pheosia gnoma* Fab. *Notodonta ziczac* Linn. *N. dromedarius* Linn. *Lophopteryx capucina* Linn. Thyatiridae *Habrosyne pyritoides* Hufn. *Tethea ocularis* Linn. Lymantridae *Euproctis similis* Fuessl. Lasiocampidae *Malacosoma neustria* Linn. *Philudaria potatoria* Linn. Drepanidae *Drepana binaria* Fab. *D. lacertinaria* Linn. *Cilix glaucata* Scop. Nolidae *Nola cucullatella* Linn. Arctidae *Eilema lurideola* Zinck. *E. complana* Linn. *Callimorpha jacobaeae* Linn. *Spilosoma lubricipeda* Linn. *S. lutea* Hufn. *Phragmatobia fuliginosa* Linn. *Arctia caja* Linn. Noctuidae *Euxoa nigricans* Linn. *Agrotis segetum* Schiff. *A. clavis* Hufn. *A. puta* Hübn. *A. exclamationis* Linn. *Lycophotia varia* Vill. *Graphiphora augur Fab. Diarsia brunnea* Schiff. *D. mendica* Fab. *Ochropleura plecta* Linn. *Amathes c-nigrum* Linn. *A. triangulum* Hufn. *Axylia putris* Linn. *Euschesis comes* Hübn. *E. janthina* Schiff. *Noctua pronuba* Linn. *Lampra fimbriata* Schreb. *Mamestra brassicae* Linn. *Melanchra persicariae* Linn. *Polia nitens* Haw. *P. nebulosa* Hufn. *Diataraxia oleracae* Linn. *Ceramica pisi* Linn. *Hadena bicolorata* Hufn. *H. compta* Schiff. *H. bicruris* Hufn. *H. rivularis* Fab. *Cerapteryx graminis* Linn. *Leucania pallens* Linn. *L. impura* Hübn. *L. comma* Linn. *L. lithargyria* Esp. *Caradrina morpheus* Hufn. *C. alsines* Brahm. *C. blanda* Schiff. *Dipterygia scabriuscula* Linn. *Apamea lithoxylaea* Schiff. *A. monoglypha* Hufn. *A. epomidion* Haw. *A. remissa* Hübn. (ab. *obscura* Haw.) *A. secalis* Linn. *Procus strigilis* Clerck. *P. latruncula* Schiff. *P. fasciuncula* Haw. *Euplexia lucipara* Linn. *Thalpophila matura* Hufn. *Petilampa minima* Haw. *Cosmia pyralina* Schiff. *C. trapezina* Linn. *Rusina tenebrosa* Hübn. (*ferruginea* Esp.) *Cryphia perla* Schiff. *Apatele psi* Linn.

Hylophilidae *Pseudoips bicolorana* Fuessl. Plusiidae *Plusia chrysitis* Linn. *P. iota* Linn. *P. pulchrina* Haw. *P. gamma* Linn. *Unca triplasia* Linn. *U. tripartita* Hufn. *Hypena proboscidalis* Linn. *Zanclognatha tarsipennalis* Treits. *Z. nemoralis* Fab. *Laspeyria flexula* Schiff. Geometridae *Geometra papilionaria* Linn. *Hemithea aestivaria* Hübn. *Hemistola immaculata* Thunb. *Iodis lactearia* Linn. *Calyothysanis amata* Linn. *Scopula imitaria* Hübn. *Sterrha dimidiata* Hufn. *S. aversata* Linn. (inc. ab. *remutata* Linn.) *S. trigeminata* Haw. *S. biselata* Hufn. *Xanthorhöe ferrugata* Clerck. *X. spadicearia* Schiff. *X. fluctuata* Linn. *Perizoma alchemillata* Linn. *P. flavofasciata* Thunb. *Ecliptoptera silaceata* Schiff. *Lygris mellinata* Fab. *Cidaria fulvata* Forst. *Dysstroma truncata* Hufn. *Hydriomena furcata* Thunb. *Philereme transversata* Hufn. *Epirrhöe alternata* Müll. *Acasis viretata* Hübn. *Ortholitha chenopodiata* Linn. *Asthena albulata* Hufn. *Eupithecia pulchellata* Steph. *E. intricata* Zett. ssp. *parcenthata* Freyer. *Eupithecia absinthiata* Clerck. *E. castigata* Hübn. *E. icterata* Vill. *E. abbreviata* Steph. *E. sobrinata* Hübn. *Gymnocelis pumilata* Hübn. *Abraxas grossulariata* Linn. *Lomaspilis marginata* Linn. *Bapta temerata* Schiff. *Deilinia pusaria* Linn. *D. exanthemata* Scop. *Campaea margaritata* Linn. *Semiothisa liturata* Clerck. *Ennomos quercinaria* Hufn. *Deuteronomos erosaria* Schiff. *Selenia tetralunaria* Hufn. *Crocallis elinguaria* Linn. *Opisthograptis luteolata* Linn. *Ourapteryx sambucaria* Linn. *Biston betularia* Linn. (inc. ab. *carbonaria* Jordan, etc.) *Cleora rhomboidaria* Schiff. *Alcis repandata* Linn. *Ectropis biundularia* Borkh. Cossidae *Zeuzera pyrina* Linn. Hepialidae *Hepialis humuli* Linn.

Although a negative correlation was found to exist between the index of diversity and wind speed (and therefore probably also numbers of individuals) this was very slight and may be more correlated if temperature is held constant as apparently there is a positive correlation between temperature and wind speed (i.e. windy nights are warmer than still nights) which would reduce the gradient of the regression line (see Williams, 1940). A multiple regression analysis would disclose the interrelations.

A westerly air-mass was predominant over most of the trapping period, as is usual in Great Britain during the summer months; on nights of winds from the north there was a lower catch in general, however there were too few of these occasions for a significant analysis to be carried out. The westerly (Tropical Maritime) air-mass would bring in warm, humid weather which would affect the catch by increasing it, compared to northerly (Polar) air-masses which would reduce the catch by introducing colder air.

There was very little correlation between cloud cover and numbers of individuals and obviously more samples, and possibly multiple regression analysis, is required before a significant effect can be found. The factor most associated with cloud cover, from an entomological point of view, is moonlight, and larger catches are associated with overcast nights (no moon) than on clear, moonlit nights (Pinchin & Anderson, 1936; Williams, 1940). Clear, moonless nights produce an intermediate catch, but this is due to low temperatures caused by rapid heat loss after dusk.

Visibility is related to humidity and varies little during the summer, also the enclosed nature of the trapping site would cause this to have little effect. As far as is known, this factor has been studied very little, but fog was studied by Williams (1940) who found, in general, a low catch on foggy nights, except for Noctuid moths whose captures increased in some cases and the diffuse area of light is suggested by him to be more attractive to these moths than a point source, thus conflicting with the more generally accepted theory that a point source attracts insects more than a lighted area. It could be that the slight negative correlation observed between relative humidity and number of individuals (Fig. 13) in this investigation may have been caused by the reduction in visibility.

Conclusion

The major factor affecting the activity of nocturnal macrolepidoptera is temperature, which is found to be positively correlated with the number of individuals and the diversity of the catch. Therefore as the air temperature increases, so does the catch, and its diversity.

The other factors were found to be related to temperature and their effects were therefore difficult to analyse, for example, pressure causes an increase in the catch but only because a rise in pressure causes a rise in temperature which increases the catch.

Humidity was expected to be positively correlated with the catch but was found to be negatively correlated, and it was suggested that its effect could be discovered by using a larger number of samples, and by isolating its effect using multiple regression analysis. Similarly, more samples and multiple regression analysis could be used to determine the effect of wind speed (if it is correlated with temperature) on number of individuals and diversity, and between the two major families (Noctuidae and Geometridae) or, perhaps, species of differing average weights or wingspans.

To analyse the remaining factors a much larger number of samples must be taken. No typically "good" or "bad" nights occurred during the study and a number of extreme nights might have favourably affected the analysis. Other work which could be done on this topic would be an analysis of the effects of meteorological factors on single species, or groups of closely related species, as it may be that one group is affected mainly by temperature, say, and another by another factor such as wind speed. From an economic point of view, studies of this kind are useful in agriculture (e.g. Theobald, 1926) in forecasting the fluctuations in populations of certain pests, provided that meteorological forecasts can first be relied upon.

I should like to thank The Radiochemical Centre for the use of their "wind machine".

Paul Seldon (4115)

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NOTES AND OBSERVATIONS

IMMIGRANT HAWKMOTHS IN WEST MIDDLESEX:— On 20th September, 1975, a fully grown larva of *Celerio galii* Rott. (Bedstraw hawkmoth) was found wandering across a path in a nursery in Harmondsworth, Middlesex. It had probably come from a nearby Fuchsia hedge, although thorough searching failed to produce any further larvae, nor indeed any evidence of recent feeding. The larva pupated and overwintered successfully as a pupa.

On 4th October, 1975, an adult *Macroglossum stellatarum* L. (Hummingbird hawkmoth) was found feeding on Buddleia in hazy sunshine in a garden in West Drayton, Middlesex, by Mr. M. Harvey. M. J. Hough

HELP WANTED: — For work on Noctuidae immigrant to the British Isles. I should be most grateful for any unpublished accounts of the finding of *wild* larvae or pupae, with dates and later history if possible, of the following species: *A. ipsilon, P. saucia, E. occulta, M. albipuncta, M. vitellina, M. unipuncta, P. meticulosa, Spodoptera littoralis, Caradrina exigua, Trichoplusia ni,* and of any of the scarcer immigrant species.— *R. F. Bretherton,* Folly Hill, Birtley Green, Bramley, Guildford, Surrey GU5 0LE.

UNUSUAL PAIRINGS: — On 13th June, 1975, I placed a pair of freshly emerged Privet hawk (*Sphinx ligustri* L.), and a pair of Eyed hawk (*Smerinthus ocellata* L.) in a small rearing cage in order to try and obtain a pairing.

The cage, containing the moths, was placed outside as the night was quite warm with the intent that any males of both species might have been attracted to the females and thus proving their existence in the locality. However, by 11 p.m., no males had arrived, nor any pairing obtained. Just before midnight I decided to have one last look and to my amazement I found a male Privet hawk in copulation with a female Eyed hawk. I immediately took the container into the house, in order to remove the other insects in case their flutterings disturbed this unusual cross. The insects were then photographed and placed in the dark. They remained paired till dusk of the following evening, when soon after, the female Eyed hawk began to deposit eggs.

An interesting point to mention is that the female Eyed hawk had been trying to release herself from the grip of the male for several hours with a great deal of convulsive movement and beating of wings. This seems to be some evidence that the two species are not compatible. The eggs produced by the Eyed hawk were infertile, as expected, but took an unusually long time to collapse and shrivel as is the tendency of most infertile ova. Also during June I had another unusual pairing between Lime hawks (*Mimas tiliae* L.). During the month, I had over a dozen emergences with males and females out in equal numbers. However, no pairing was obtained until only one pupa of each sex was left. First, the female emerged only to be followed ten days later by the male. By this time the female was weak and battered but had not deposited a single egg. During the evening the male emerged, the female began to "call" as usual with her scent organ protruding rhythmically and by 11.30 p.m. the male had paired with her and I left them for the rest of the night.

When I examined them the following morning I found the female to be dead but firmly gripped by the male who released her that evening.

Has anybody else had any unusual pairings concerning the hybridization of moths? I would be interested to hear from anyone who has any success. A. E. C. Adams (5060)

JUNIOR MEMBERS' PRIZES:— May we remind all our Junior members that prizes are awarded at our Annual Exhibition each year to those exhibits which in the opinion of a panel of judges, show outstanding merit in presentation. The subject matter is immaterial. Why not have a go this year? Our February issue showed last year's first prize exhibit and we hope to publish this year's also.—Editor

WHERE DID ALL THE RARITIES COME FROM?—As Editor I need to make frequent use of Kloet & Hincks "Checklist of British Insects". The second edition, part 2, contains a considerable number of additions over the first, which are marked with an asterisk and which I see from the general explanation section signifies "species of doubtful status, including immigrant and adventitious species of fairly regular occurrence". Quite frankly I would like to cast very serious doubt on the accuracy of this definition for the majority of the species listed, unless it really also means "listed and sold by dealers". Consider a few of the Butterflies. *Parnassius apollo* L. and *P. phoebus* Fab. *Apollo,* granted is in the old pre-1850 books, but *phoebus? Colias palaeno* L.? How do these high mountain species get into the British list? Let alone the Asiatic *Rapala schistacea* Moore and the two mediterranean species *Parnalius rumina* L. and *Euchloe ausonia* Hubn. Is somebody hiding them in their gardens; regularly importing and releasing; are they in fact regular migrants; are they adventitious? If any of these, why does nobody report the fact? Why does nobody write and record them regularly in the Entomological press? Perhaps they do. If so then in which Journals? I never seem to see them with all the resources of the Balfour Library behind me. Could it be that lists are privately circulated to a favoured few? (vide Hewitson!). I know not, neither do I know where and when and on what grounds so many changes of name take place. I do appeal to the high-powered brains who write and/or edit the books which are the tools of our hobby to find the time, just occasionally even, to send us a few notes for publication letting us know of these things.—

Brian O. C. Gardiner (225)

SPRING ON MARCH 27th IN CAMBRIDGE:— After a spell of indifferent and somewhat odd weather, although we have experienced no real winter, March 27th turned out warm and sunny. The first siting was during the sermon when a Small tortoiseshell (*Aglais urticae* L.) after a preliminary warming up period of fluttering in the aisle, took off and flew to the nearest window. This is not the first time we have seen this species in church and indeed it would seem that such buildings are ideal hibernation sites. On coming out of church a Peacock (*Inachis io* L.) was observed in the churchyard. Back home, coffee on the lawn was enlightened by two Brimstone males (*Gonepteryx rhamni* L.) who flitted across the garden. The garden was also found to be teeming (it was easy

enough to find 2–300) with ladybirds, most of which were of the 7-spot variety (*Coccinella septempunctata* L.). A number of Bees and Flies were also seen but not identified.—Brian O. C. Gardiner (225)

JUNIPER SHIELDBUG RECORDED IN FARNHAM:— On the afternoon April 10th, 1976, I took a male specimen of the Juniper shield-bug, *Cyphostethus tristriatus* (Fabr.)—Hemiptera, Acanthosomatidae—in the garden of my house on the outskirts of Farnham, Surrey. The principal food of this species, both for the larvae and the adults, is ripe juniper berries, *Juniperus communis.* There is no evidence that the bug ever feeds on any other plant. As far as I am aware there are no juniper woods nearby. Perhaps, however, the specimen I took over-wintered on a bush "imported" to another private garden in the neighbourhood from a nursery.—D. H. R. Keen (3309)

BOOK REVIEWS

INSECTS AND OTHER INVERTEBRATES IN COLOUR by Ake Sandhall. 1975. pp. 204. small 8vo. Lutterworth Press. Price £3.95.

This book consists of 432 excellent colour photographs, arranged three to a page, and each with an accompanying description. The material is arranged, not according to any systemic order, but where the creatures are most likely to be found such as on the sea shore and on cultivated plants. Since the author is a Swede a number of non-British species are not unexpectedly included.

While some of the same old subjects keep popping up in book after book, page 12 showing Red admiral, Peacock and Camberwell beauty being the prime example, the majority of the photos in this book are new and really show a number of insects in a new light. I particularly like the wasps and flies caught by the camera while in possession of their prey. The shot of the Many-plume-moth is totally unlike so many pictorial representations in the standard books and shows it as it really is.

The book continues with a useful synopses of the various invertebrate families, illustrated with little line diagrams and there is quite an extensive bibliography. The glossary is too brief to be really useful except to the veriest tyro at whom perhaps this book is really aimed and as a general guide to the insects (and a few near relatives) of the north-western palearctic area it suits its purpose admirably and in spite of a few slightly unnatural looking colours again shows the superiority of good colour photography and printing over other forms of illustration.

BOCG

THE INTERNATIONAL BUTTERFLY BOOK by Paul Smart, 1975. pp. 275 size A4 (approx. Demy 4to). Thomas Y. Crowell Co., New York. Price £6.50.

This superb volume will surely be one of the outstanding books of the

year. Coming as it does in the wake of a recent glut of expensive books, which culminated perhaps in D. V. Alfords "Bumblebees" at £25, it is relatively inexpensive at £6.50, without sacrificing quality for the sake of cheapness.

It contains a comprehensive survey of the 15 Butterfly Families, giving absolutely full coverage of eight of them, including all the genera of a further five, and all the tribes of the remainder.

The first 12 chapters form a lucid, well set out guide to many of the main aspects of entomology, including such topics as mimicry, genetics, variation, colouration, breeding and collecting. There is also a fascinating chapter on "Butterfly History", which considers the early entomologists, literature and collecting methods. We are also treated to a large, full colour reproduction of the frontispiece from Moses Harris "Aurelian". These opening chapters also contain many other fine plates of living specimens, although on the debit side, one wonders why the same plate has been reproduced twice, both on pages 12 and 48. Another error concerns one of the plates on page 106, where the caption for the two specimens labelled 5 and 4 has been transposed. The quality of this particular plate is also poor, since the four examples of *P. napi* were photographed against a white background, and the ensuing touching up, imperfectly done, has given them a very crude appearance.

Following the introductory chapters are the superlative plates, positively the best I have seen in any recent publication. Over 2,000 specimens are shown in full colour and at actual size, without an antenna, let alone a wing out of place. The only noticeably distorted specimen is at the top right-hand corner on page 167. However, although technically and aesthetically excellent, the numbering on some of the plates, particularly those crowded with the smaller specimens, tends to be rather erratic. This makes it difficult to locate some species by their number which appears with their name in the caption at the bottom of each plate.

Following the plates is a comprehensive systematic list covering some 5,000 species, giving in each case its author and synonym as well as additional details with each tribe or genus covering the type species, distribution and larval food plants. Brief descriptive notes are also included for those species not illustrated. The usefulness of some of the entries is debatable and the criteria by which those species included were selected is unclear, but the list is certainly very extensive and, as far as one can tell accurate, notwithstanding the brevity of some of the notes.

All the butterflies illustrated or mentioned in the body of the text are included in the final part of the book, the index, which gives references to specific generic and vernacular names. It also includes the other scientific divisions and most of the topics and phenomena mentioned throughout the text. It may also be added that the chapter headings and their additional sub-headings provide a good guide to the material therein.

However fine the plates may be, the ultimate value of a book of this kind is measured in its practical usefulness, and so, taking a large store of unidentified foreign Rhopalocera, I put its powers of identification to the test. It proved successful in identifying to specific level over 60% of my sample with a further 20% being assigned to their proper genus. (Failure to identfy these further was mainly due to the fact that most of them belonged to more complex genera such as *Colotis, Eurema* and *Heliconius.*) The remainder were mostly of the more scantily covered families, *Lycaenidae* and *Hesperiidae.*

This was a commendably high success rate in what was, since all the common species had been identified long ago, a difficult sample. A cliche, sometimes used by reviewers, is to say that "this is a book we have long been waiting for" but members will be aware that this book was preceded by Brigadier H. L. Lewis's "Butterflies of the World". However, the former is somewhat more extensive and having compared the two books, I feel justified in saying that Paul Smart's book far outweighs the other in value and quality, so perhaps the cliche, though trite, is true.

A lamentable fault is the fact that it is case-bound though this is doubtless a cost saving feature. The overall production standard otherwise is very good, and I was particularly pleased to note the minimal effect of that common colour-plate affliction, centre of page distortion, which so often rends in twain specimens which overlap both pages. The taxonomy, incidentally, is familiar and uniform throughout, so that no confusion or hindrance arises in identification or cross referencing with other standard works.

I recommend this volume to all entomologists, beginner and veteran alike, and indeed to anyone who appreciates fine colour plates. The author is to be congratulated on producing such an admirable addition to the entomological literature.

C.J.G.

In 1856 H. T. Stainton published in his Entomological Annual for that year a list of Entomological Books then on sale in London, together with a short critical sentence of his opinion on each. It will be seen from the following that Victorian criticism was more outspoken than are many modern book reviews, but what really is of interest is that it appears in general that whatever a reviewer originally wrote about a book, by the time it has become second-hand—or perhaps antiquarian as these now are—the subsequent demand (as reflected in prices) bears no relation to the reviewers remarks. In the extracts below the current prices are those noticed by your editor in recent booksellers lists.

MORRIS' NATURAL HISTORY OF BRITISH BUTTERFLIES. (£1).

This is not a scientific book, neither indeed does it purport to be so. It is the kind of work we have often been asked for; one in which *English*

names are put prominently forward, but many of the English names here applied are not those by which the species are known to any but the reader of Mr. Morris' work. Those to whom money is no object may do well to buy it. It is more costly and of less value, than Westwood's Butterflies of Great Britain, but perhaps more readable and pleasanter for the young.

(Current price, in poor condition, £30.00).

WESTWOOD'S BUTTERFLIES OF GREAT BRITAIN. (15/-).

The best work that has yet appeared on this subject, though still far from what we could wish. Absurb blunders are repeated, and fresh one perpetrated, but Entomologists of the present day are so little given to reading, that few are likely to notice the errors and perhaps few will be misled by them.

(Current price £40.00).

WESTWOOD AND HUMPHREYS' BRITISH MOTHS AND THEIR TRANSFORMATIONS. (4 guineas).

The letterpress is inferior to Stephens, and the plates far inferior to Wood: The important distinguishing feature is the figures of the larvae; these are copied from various foreign works, and where the foreign author had mistaken or confused two larvae the error is repeated.

The latter part of the second volume is probably a good sample of how badly a scientific book may be written, by an unscrupulous author, with little knowledge of the subject copying wholesale from previous authors, who were themselves not trustworthy. We trust the day when such books *can* be written on Entomology is now past—an enquiring spirit is abroad—which will not accept such trash, even though in the form of quartos, half bound in morocco.

(Current price £200.00).

HARRIS' AURELIAN. New Edition by J. O. Westwood. (4 guineas).

Contains notices and coloured figures of several of our most showy and commonest species of Butterflies and Moths. The colouring is very gaudy and little resembles the productions of Nature. For babies both young and old, who like to look at picture books, it may not be uninteresting, but as a nursery toy it is rather expensive.

(Current price £1,700).

PSEUDOSCORPIONS

When emptying a container of earth being used for pupating larvae several years ago I came across a strange creature looking like a miniature scorpion. After some enquiries I found out it was a pseudoscorpion (often called false-scorpions). These creatures have fascinated me ever since. This article is not intended to be a detailed account but a general article covering the animal, concentrating on the most interesting topics.

Pseudoscorpions form the order Pseudoscorpionida of the class Arachnida. They are quite closely related to the more familiar scorpions but differ in many points. They are common and widespread but not often encountered due to their small size and retiring habits. This is a pity because they are a fascinating group and very little is known about them.

Pseudoscorpions in Britain are usually under 3 mm. long and possess six pairs of appendages; four pairs of walking legs, one pair of pedipalps and one pair of chelicerae. The pedipalps are held out in front of the body when walking and act as the main organ of perception. Pseudoscorpions move forward very slowly, carefully investigating anything encountered with the pedipalps which possess sensory hairs, trichobothria. At the slightest hint of danger the creature dashes backwards at great speed, far faster than when travelling forward, for some distance and then remains motionless with its pedipalps tucked into its body before resuming its ponderous forward movement. (There are exceptions—several species found under bark show no avoiding reaction even when provoked.) It is these pedipalps which make the pseudoscorpion so easy to identify.

Pseudoscorpions basically inhabit two types of terrain.

(i) Permanent and stable areas, like woodland litter and soil.

(ii) Temporary and less stable areas, like decaying trees, barn refuse and animal nests. However any area which is slightly moist and supports adequate numbers of potential prey is suitable. Most species are very selective being adapted to dwell in certain conditions. The type of reproductive mechanisms plays a large part in determining its habitat.

Pseudoscorpions are strictly carnivorous feeding on a variety of creatures as long as the size is suitable, which can be slightly larger than the pseudoscorpion itself. Collembola and mites are favoured though it will eat beetle larvae and eggs of snails. On encountering a suitable prey (in this case a collembola) the pseudoscorpion very gently approaches till its pedipalps are almost touching the animal. Then with a sudden movement both pedipalps simultaneously grasp the prey. The tips of the pedipalps possess a poison tooth which ejects poison. When attacked like this the collembola jumps into the air—and both the prey and pseudoscorpion land with the pseudoscorpion still gripping tightly. Now the prey is transferred from the pedipalps to the chelicerae. Digestive juices are now pumped into the quiescent prey—and digests the body contents. This is periodically sucked up and the prey is seen to periodically inflate and deflate. After about half an hour the carcass is discarded. During normal movement, but especially after feeding, the pedipalps are passed through the chelicerae. The chelicerae possess a comb like serrula which effectively removes all detritis from the pedipalps—ensuring the

poison tooth is not blocked. Pseudoscorpions are present in low numbers and have a scattered distribution, hence they have little effect on populations of detritis feeding animals. They can be thought of as either secondary or tertiary consumers.

Fig.1 Dorsal aspect of Pseudoscorpion based on a specimen of Chelifer cancroides

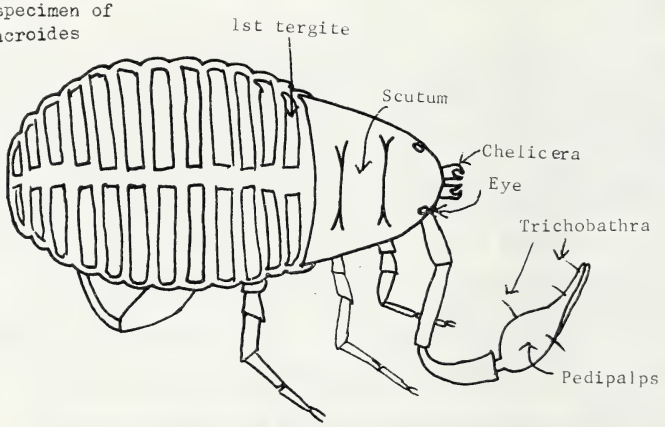


Fig. 2 Chelocera of Pseudoscorpion

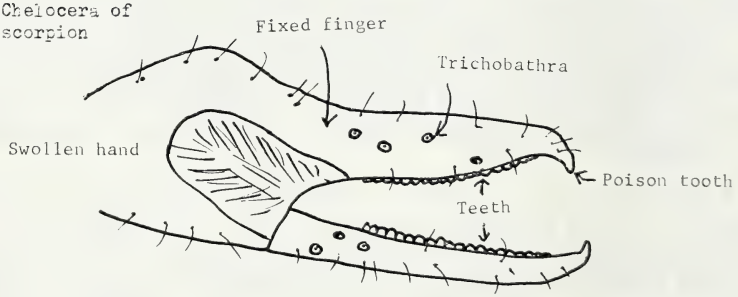
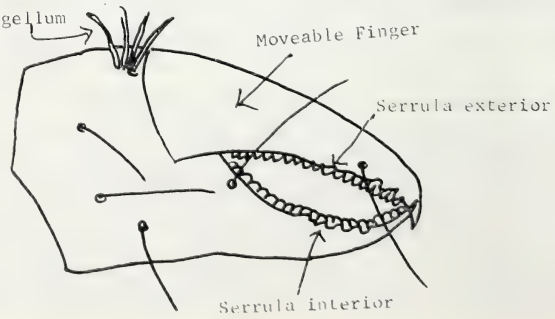


Fig. 3 Palpal Chela of Pseudoscorpion



Reproduction in pseudoscorpions is very interesting—with several fascinating aspects. There are basically four groups of mating patterns which can be used in classification, for they are such constant features.

1. Sperm transfer with no mating—male and female acting independently both temporarily and spatially.
2. Sperm transfer with no mating—male acts only in presence of female.
3. Sperm transfer with mating. Both sexes active.
   (i) No firm body contact during nuptial dance.
   (ii) Firm body contact during nuptial dance.

Sperm transfer in all cases is achieved with the use of a spermatophore. This basically is a globular sperm packet placed at the apex of a peduncular stalk. In case 1 above, the spermatophore is deposited randomly by the male on suitable surfaces. In cases 2 and 3 the spermatophore is deposited only in the presence of the female, with or without nuptial dancing. This dancing usually takes the form of grasping the partner's opposite pedipalp—and moving backwards and forwards. Each species has a distinctive pattern to its dance. In all cases the sperm packet is inserted into the female's genital atrium where it ruptures mechanically involving some swelling mechanism which liberates the sperm. In the Cheliferidae mating involves a nuptial dance with the female being guided by the male over the spermatophore. The complexity of the spermatophore is correlated with the type of mating behaviour involved. A complex spermatophore only formed in the presence of a female has considerable advantage, avoiding unnecessary wastage and allowing colonisation of more rigorous habitats.

The fertilised female constructs a brood-chamber, usually about mid-May in the species *Chthonius ischnocheles.* (The following observations apply to this species only.) A silken chamber is constructed, the silk gland is found in the cephalothorax and opens by spinnerets at the tips of the moveable fingers of the chelicerae. Earth particles coat the silk so the final structure is well camouflaged. After three to four days a slight white swelling appears under the abdomen of the female. In the following days this rapidly expands into a large sphere which considerably hampers the movement of the female and is in fact the developing external embryo. After a few more days the protonymphs emerge. These are miniature replicas of the adult. They stay in the brood chamber up to three days. Up to 25 can be present in one chamber. When first hatching they are unable to fend for themselves as I found to my cost when I prematurely opened a brood chamber, however after a few days they leave the chamber to fend for themselves. Before reaching the adult the protonymphs pass through deutonymph and tritonymph stages. These stages are recognised by the number of trichobothria on the head of the pedipalp, one on the protonymph through to four on the adult. For each

moult a new chamber is constructed. Chambers are also built for shelters throughout the winter, these are called hibernaculums.

An interesting phenomena shown by pseudoscorpions is phoresy. This is where pseudoscorpions attach to the appendages of larger creatures and is thus carried about. There is considerable speculation as to what this really represents. Some people think that phoresy is an aid to dispersal, and one definition has been given as "a non-parasitic association of one kind of animal with another to obtain transport". However it is now being thought that phoresy is not primarily connected with dispersal—but has simply come about as a result of the predacious habit of pseudoscorpions. A new definition of phoresy can now be made "a non parasitic association of one kind of animal with another which results in the transportation of the smaller by the larger". This avoids the question of the reason for the association. More than 55% of species known to exhibit phoresy come from the Chernetidae family. As a result of this the Chernetidae are very successful, exploiting a large range of permanent and temporary habitats. It is interesting to note that this behaviour is usually confined to adult specimens, mainly females just after rearing their brood in the summer. This seems to indicate that the habit may be triggered due to the need of finding a more plentiful food supply. (If any members have come across this phenomena I would be very interested to hear, preferably with the species of pseudoscorpion involved. Could members running moth traps watch out for pseudoscorpions on crane flies? Any information would be greatly appreciated.)

Until one has the knack finding pseudoscorpions is not easy and is quite time consuming. Using a sieve over a large white tray is quite effective. The best method of collecting is by the use of a Tullugren funnel. Here an electric light bulb is suspended over the material, and the pseudoscorpions are collected in alcohol as they fall from the funnel. This is ideal for long term quantitative experiments, and can be modified to collect live specimens.

Pseudoscorpions are easy to keep alive for considerable periods of time. A glass jar containing moist sand is ideal. To this should be added bark or leaf litter to simulate the condition in which the pseudoscorpion was found. Care should be taken to avoid condensation and mould. The lid should be tight fitting because pseudoscorpions can get into the minutest space. Food should not be given too often, once a week being sufficient. One individual I collected and placed in a dry tube with no food—and forgot for over a month. I was amazed to find it still alive—though it went frantic in its anxiety to catch its food when offered collembola. Other species die rapidly on dessication—no one is sure why there are such large differences. Some species are often observed rubbing their legs together and the body. It is thought this may have something to do with the spread of some anti-dessication fluid. It is best to restrict

such cultures to four or five pseudoscorpions or cannibalism may occur.

For identification pseudoscorpions are best preserved in 70% alcohol, with glycerine added to prevent the creatures becoming brittle. For identification a good dissection microscope is needed—and a key. The best key is found in publication 10 of the Linnean Society by Owen-Evans. Although there are only 27 species identification to begin with is difficult, mainly because many of the diagnostic features are not easy to locate and interpret.

I hope this article may interest other people to pay some attention to this much understudied group. They are fascinating creatures and a lot more has to be learnt from them.

P. M. Heath (4167)

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NOTES ON BRAZILIAN INSECTS

Rhynchophorus palmarum L.

This large Curculionid is entirely black. Its smooth oval thorax tapers towards the head. Its length from abdomen to head—but excluding the long "snout"—is about $2\frac{1}{2}$ inches. Deep longitudinal striations, curving slightly at the ends, adorn its elytra.

It is considered to be one of the principal pests of palms in general—coconut palms in particular. (Some other beetle pests are *Homalinotus coreaceus,* Gyll and *Rhina barbirostris,* Fabr., both *Curculionidae;* and the *Scarabidae, Megasoma elephas,* Fabr., and *Stratigus aloeus,* L.)

Some years ago, when a friend was showing me his small farm near Recife, where a few young coconut palms were growing, his foreman drew our attention to a chorus of faint squeaky sounds coming, apparently, from one of these palms. On putting an ear to its trunk, the squeaks were much more audible, confirming that they came from this tree. The foreman said the tree was infested with "brocas" (borers), and ought to be burned. Accordingly, within an hour it was cut down and its 25 ft. trunk chopped into sections. In the debris, before it was burned, I found three adult *R. palmarum,* and saw several plump whitish larvae, all near the base of the trunk. Some squeaks were still being heard, and probing in two or three of the trunk sections, the foreman extracted a few more larvae, which, evidently had been producing the sounds. After being removed from their galleries, however, the larvae were silent.

Previous to this I had seen a few adult specimens of this weevil in Alagoas, in regions where a species of palm grows wild, scattered sparsely about the countryside. (This palm produces clusters of small nuts, whose edible oil-rich kernels resemble hazel-nut kernels in size and appearance.)

Since then, I have found *R. palmarum* to be fairly common in the highlands of Minas Gerais where coconut palms are few, but where palms of several other species flourish. Once, shortly after the end of the rainy season, on a sunny day early in May, I came upon a 30 ft. palm near the roadside, its trunk split and buckled, about 3ft. above the ground. Most of its length was on the ground, rotting in the lush grass, and on its thorny trunk several *R. palmarum* adults were sunning themselves. When I kicked the trunk, some more emerged from its decaying interior, and falling to the ground, disappeared in the grass. I neither saw nor heard any larvae. At other times, I have seen occasional solitary specimens of *R. palmarum* basking on the trunks of Royal and other ornamental palms in the Botanical Gardens in Rio and the Municipal Gardens in Belo Horizonte, without, however, detecting any signs of deterioration in these beautiful palms that might have been caused by these beetles.

Mecistogaster Sp.

I had been asked by a friend in Belo Horizonte to take any out-of-the-common Odonata for him. Accordingly, while staying in Belem for a few months in 1967, whenever an opportunity occurred I caught a few dragonflies and damselflies which I thought would be of interest for his collection. Among these were three *Mecistogaster* damselflies (all of the same species) which I was fortunate enough to come across and catch.

This species has a wingspan of $5\frac{1}{2}$ to 6 inches. The length of its body is a fraction more. The wings—all four—are of similar size and shape, wire-thin at the base for $\frac{5}{8}$ inch before widening gradually to their full $\frac{1}{2}$-inch breadth. The colour of the wings is pale buff, with a small darker apical patch; the thorax and slender abdomen are yellow-brown.

All three specimens were taken within 30 miles of Belem, on the borders of the Para River, in heavy forest, but on different days. The ground was very wet and "squelchy". This was in the comparatively dry months of August, September, October, when, however, there are often some short showery spells. The tangle of interlaced boughs, creepers and foliage was penetrated by thin shafts of sunlight; and where these mote-speckled sun-rays were most numerous and the forest floor most water-logged, was where I most often saw *Mecistogaster* damselflies. They were usually on the end of a leafless twig or the tip of a stiff leaf, in a prominent position, usually out of reach of my long-handled net.

They would "take off" from their resting place with a flicker and a golden-green glitter as the sun-rays played on their hyaline wings. These

sudden, impulsive departures from their resting place were, I suppose, for the purpose of capturing some tiny insect in flight—but if so, the prey must have been very minute indeed, because I could discern nothing of their prey. They always returned to their starting point or to a position very near it.

They seemed to be rather solitary in habits as I never saw more than one of these Zygoptera at a time. In fact the only Odonata I saw in the heavy parts of the forest were *Mecistogaster.*

In their vicinity there were usually a few Ithomiid butterflies (species of *Pteronymia, Ithomia* and *Dircenna*), a *Heliconius phyllis* God. or two; and, sometimes, a Pericopid moth (*Eruciane bicolor*); while in some of the clearer puddles a few water-beetles were in evidence.

On the outskirts of the forest, in the fairly open terrain, amongst the grasses and rushes which lined some streams and ditches, I took some more Odonata for my collector-friend in Belo Horizonte, but none of these was a *Mecistogaster.*

Mydas heros Perty

This Mydaid fly, with a wingspan of 4 inches and a 2-inch long body, is the largest of all the Diptera. It has little of the appearance of the ordinary fly.

Allegedly, it is a predator, living on captured insects. Its larvae are said to live in the nests of the destructive leaf-cutting "sanva" ants, in apparent harmony with intruders (larvae) of other orders—on which, however, they feed.

The long, wasp-shaped body of *M. heros* is black with two or three narrow transverse bands formed by yellow hairs, on the upper side of the abdomen at its junction with the thorax. The wings are rusty-brown.

Thus, in shape, size and colouration, this huge fly mimics the tarantula-hunting Pompiliid wasps, particularly the fearsome *Pepsis atrata* Lep., of similar size, which it most closely resembles though *Pepsis* has a brighter metallic sheen, and its wings are of a reddish hue, rather than rusty-brown. And not only with these qualifications does *Midas* copy *Pepsis;* it also emits an angry-sounding buzz similar to that made by this wasp, and thereby, presumably, warns off such enemies as birds and lizards.

Once captured, *M. heros,* being a Diptera, is, of course, easily distinguished from *P. atrata* or other wasps, by its single pair of wings and tiny "balancers" or halteres, which points cannot be observed when the insect is flying.

M. heros is a somewhat uncommon fly, but during the period at the commencement of the dry season, it may be seen, and heard, while hovering about the grasses and shrubs which flower on sunny hillsides and slopes bordering lakes and streams.

In Minas Gerais, on the slopes of the Serra do Curral (alt. 3,000 ft.) I have frequently seen *M. heros* at midday during April, buzzing noisily, and looking and sounding every bit as formidable as the giant wasp it mimics.

T. C. Hanson (5242)

A JOURNEY TO THE OKEFENOKEE SWAMPS IN S.E. GEORGIA, U.S.A.

The Okefenokee swamps of Southern Georgia constitutes 1,500 square kilometres of protected wildlife habitat, a part of which I was fortunate enough to visit in September, 1975. My family drove from Nashville, Tennessee, where we live, to Waycross, Georgia (the nearest "centre of civilisation" to the swamps) where we arrived on September 5th. After checking in at a motel at Waycross I decided to have a swim in the pool —I also examined the contents of the skimmer filter, as I always do, and found some interesting insects there. Foremost, I found two Gryllotalpids (Orthoptera) that had drowned in the pool the previous night. Both individuals were of the same species and I first thought that it was *Gryllotalpa gryllotalpa* L. which has apparently now established itself in some of the Eastern states. I have since ascerted however that they were rather large examples of *Neocurtilla hexadactyla* Perty. Here I also found some large Carabid beetles (35 mm.) that I could not identify as well as countless earwigs of the family Labiduridae (*Labidura bidens* Olivier) that I later found in vast numbers almost everywhere in Waycross. I measured the length of the forceps (cerci) of a number of individuals and discovered all lengths between 2.5 mm. and 5.5 mm.!

The following morning (6th September) we drove about seven miles from the motel to the entrance of the mysterious Okefenokee swamps and after reluctantly leaving our air-conditioned car for the heat and humidity of Southern Georgia in early September I was astounded by the activity in the dark waters surrounding the entrance to the park. For example, I found a group of about 200 frog tadpoles in some reeds one of which I was able to scoop up into my hand—it was about 70 mm. long and had not even developed hind-limb rudiments! After entering the swamps I discovered that these as well as the alligators (*Alligator mississipiensis* Daudin) were rather common. As far as is known these swamps provide refuge for: 180 bird species; 30 fish species; 20 amphibian species; 47 reptile species; 45 mammal species and unknown number of species of insects and most other invertebrates. Work is being carried out on the insects however by the staff of both Cornell and the University of Georgia, at Atlanta.

"Okefenokee" is a word given to the area by the Seminole Indians who formerly inhabited the swamps and literally translated means

"trembling earth"—a reflection of the great instability of most surface islands and vegetation on the swamp. There are however a large number of true islands providing truly terrestrial habitats where most mammals occur and where many insects breed. Dotted about the swamp in almost regular spacing were the dominant swamp cypress trees (*Taxodium distichum*) but Slash pine (*Pinus elliottii*) and Sweetgum (*Liquidambar styraciflua*) were also common. I went on a deep swamp tour in a punt and noticed that the water was a dark tea colour (due to the liberation of tannic acid from decomposition processes of dead vegetation). I also noticed that there were very few mosquito larvae or imagines as I had anticipated but instead there were fairly large numbers of persistent Tabanid flies that continually tried to suck my blood. The insects most apparent when travelling through the swamp undoubtedly belonged to the Order Odonata especially the Sub-Order Anisoptera. I would not like to estimate the number of species I saw but I continually saw new species all day and most emergent vegetation from the swamps was virtually covered by them. The Anisoptera were far more aggressive than I have known before. For example, I saw one individual resting on some tree bark chewing at the thorax of a Zygopteran almost twice the size of itself having already devoured its head! Another individual was pursuing a Pyralid moth that landed on the edge of the punt a few centimetres away from my arm. As I bent forward to examine the moth, the Anisopteran darted on to it, seized it, and proceeded to chew at it, undeterred by my presence. Surprising to me was the fact that the Tettigonidae (Orthoptera) were also very abundant, almost as much so as the Anisoptera—there were however only a few species represented. The presence of these two dominating insect groups almost concealed the presence of less abundant insects. In areas of water aerially shaded by trees and other plants there were very large concentrations of Gyrinid beetles of the genus *Gyrinus.* Of the Lepidoptera, the Pyralidae were common and belonged mainly to two species with which I am afraid I was not familiar. These were mostly seen resting on emergent reeds but were easily disturbed when they would fly a few centimetres above the water surface to a new resting place (during these intrepid flights most were eaten by Odonata or leaping fish). Also of interest was that inside the stems of the Water Lilly (*Nymphaea odorata*) were Pyralid larvae and apparently almost every stem contains these larvae as is well known by local fishermen who use them as bait. The only other moths I saw were a few Noctuids on tree trunks. Again, butterflies were not common presumably because of the scarcity of truly terrestrial habitats—at least in the immediate vicinities of the areas that I visited. The following were observed however:—

Family Papilionidae: *Papilio cresphontes* Cramer, *Papilio glaucus* L., *Papilio troilus* L.; Family Nymphalidae: *Speyeria aphrodite* Fab., *Limenitis arthemis astyanax* Fab., *Asterocampa celtis* B. & L.; Family

Danaidae: *Danaus plexippus* L.; Family Libytheidae: *Libytheana bachmannii* Kirtland; Family Pieridae: *Eurema lisa* B. & L., *Phoebis sennae* L.

Other families of insects seen in the swamps but not in large numbers were the following:— Acrididae, Pentatomidae, Aradidae, Gerridae, Cicadellidae, Membracidae, Psyllidae, Cicadidae, Chironomidae, Tipulidae, Muscidae. I am sorry that I was unable to put specific names to most of the insects I encountered in the swamps but I had to rely on memory for any nomenclature and therefore only named those specimens I was familiar with rather than risking any mistakes. The main reason for this is that there is a $500 fine for retaining any natural objects from the swamps, which is rather deterring—I prefer not to collect specimens just for the sake of it anyway.

Back at the motel at Waycross, just before we were about to leave the following morning, I found more interesting insects as I examined the moths that had been attracted to the corridor lamps the previous night. Most noticeable were the beautiful Noctuids belonging to the species *Noropsis hieroglyphica* Cramer. I had never seen this species before and I had been told that it was confined to Florida. I also found two male *Eacles imperialis* Druce here but this moth is fairly widespread and not uncommon over much of the U.S.A. Also present were two Arctiidae of the genus *Ecpantheria* one of which was *E. deflorata* Fab. Other moths I noted here included the following: *Xanthoptera nigrofimbria* Guenee, *Epidromia delinquens* Walker, *Drasteria erechtea* Cramer, *Melallopha apicalis* Walker, *Euclea delphinii* Boisduval.

After I had looked at these moths we left Waycross for the journey back to Nashville and on the way we managed to make a brief stop at near a small town called Mcrae in Central Georgia. This area was very wooded (mainly with *Pinus elliottii*) and as I wandered into the dark interior I saw a large yellow and black butterfly hovering very slowly over some low herbage. On netting it I identified it as *Heliconus charitonius* L. which I had never seen before. On release it flew a rapid zig-zag for about 20 metres and then settled down to its more normal lazy fluttering once more. On some tree bark I found a hawk moth which I kept as it looked like a dark form of *Ceratomia catalpae* Boisduval. Although the sun was not shining I did manage to find a few other Lepidoptera on some vegetation bordering the wood among which were the following:— *Eurema lisa* B. & L., *Lycomorpha pholus* Drury, *Atethimia subusta* Hubn. Aside from Lepidoptera, Reduviid bugs and a large number of snake species were common here.

On the whole, I found this a very interesting trip especially since I found so many insects new to myself.

L. A. Durden (4336)

THE BUCK, HEMILUCA MAIA DRURY

It was the second Sunday in October '75 when I drove to Temperance, a little town in Michigan just three miles north of the Ohio line. I had previously been in touch with Mr. Jim Tuttle who had kindly invited me down to see if we could locate the elusive "Buck Moths".

It was a beautiful fall day as I drove down U.S.24 and by 9 a.m. the temperature was into the high 50's°F. with the trees already displaying the colours for which Michigan is famous. There was very little traffic and I made good time in my Oldsmobile.

I met Jim at his house and he drove us to an area of state land surrounded by open farmland, as we approached our location a small black and white object flashed across the road and we knew the moths were flying. Further down the road we found a male *maia* that had been struck by an automobile; we picked it up and I was struck by the sharply contrasting colours. This was the first *maia* I had seen close up. It had soot black wings with the white markings, but the most vivid colour was the bright scarlet of the tip of the abdomen. It's body was curved in the characteristic pose for *maia* feigning death.

We parked the car and unloaded the nets. Although it was the middle of October the corn had not yet been cut, and we followed a path with the high corn on one side of us and woodland on the other. The woodland consisted of mainly young Aspen mingled with Oak; also present were Sassafras and Hickory. The temperature was now well into the 60's°F. and the sky was almost cloudless.

The *maia* would materialise from nowhere and flash across the path. The males were unmistakable with the red abdomens, but suddenly one flew over that appeared all black. We gave chase but it was futile. We then walked across the road into a more open area. By now the moths were everywhere; I'd never have believed it if I had not seen it myself. The moths are very fast flyers, but there was a breeze and as they flew into it, of course, their progress was slowed considerably. Jim captured a female and I was lucky enough to net one myself. It occurred to us that all the males we saw were in the process of assembling, so we attempted to track them down without success. There was a rough area in the middle of the cornfield with a copse of young Aspen trees, and this area seemed to provide an irresistible attraction for the males. However we searched every tree without locating a single "calling" female. At the end of the day we had caught three females and about a dozen males. We released the males and provided branches for the females to deposit ova. However, I was informed by Jim later that no ova were laid. Thus the females, though appearing fresh, had probably laid their ova already. Though often quoted as an Oak feeder, in this area the larvae feed on Aspen, are abundant in season and I will attempt to rear them if I can collect them from that locality in the spring.

Chris Young (5236)

GREAT PEACOCKS

Back in my childhood days, which wasn't too long ago, I always used to hear about the "Wiener Nachtpfauenauge" from fellow boarding-school scholars who knew of my interest in lepidoptera, but what finally hooked me on this species was Jean H. Fabre's account in the "Social life of insects" where multitudes of males were attracted to a virgin female.

The Giant emperor or Great peacock moth (*Saturnia pyri* Schiff.) are only two of the names given to this, the largest moth in Europe, it being rivalled in wingspan only by the introduced *Philosamia cynthia* Drury and *Antheraea yamamai* Guerin-Meneville.

It is distributed over a large area of the continent, though avoiding the colder and wetter parts, from the north of France through south Luxembourg, western Switzerland, the Iberian peninsular to Algeria and Morocco, and in the east through south Germany (rare), Austria, Hungary, the Balkans to the Ukraine. It's principal home though, seems to be the Mediterranean region, where it is very common, extending from the west to Asia minor, Iran and Armenia; in its eastern range as the sub-species *S. pyri teharana.*

I have been fortunate in being able to stay on many occasions on the shores of Lake Neusiedle in N.E. Austria, where *S. pyri* is very common, and in '73 and '74 decided to take a closer look at this phantom denizen of the night.

Here the adults emerge in mid May, but in other parts of its range this event can occur any time between late April and late May, depending on latitude. Sometimes though, if the spring temperatures are too low, emergence may be delayed one year, an event quite common in bred British stock.

Wild females from this region have a wingspan between 14 and 16.5 cm.; males being 1 to 2 cm. smaller. In this country bred specimens are nowhere near this size.

Come dusk, the process of wing-expansion over after emergence in the late morning, females call from the tree trunks up which they have climbed. Soon the still night air is filled with myriads of amorous males, bobbing about as if on invisible strings, following scents like bloodhounds on a trail.

In most cases pairing takes place just before midnight, the couple staying as such for about 22 hours. After separation the males fly off to woo some fresh bride while the females climb to the highest vantage point possible before launching themselves into space, usually towards the nearest shadow which, often as not, is a tree. The reason for this strange behaviour is that they carry too many eggs at first and are hence bottom-heavy. This stop-start process continues until about 30 ova have been

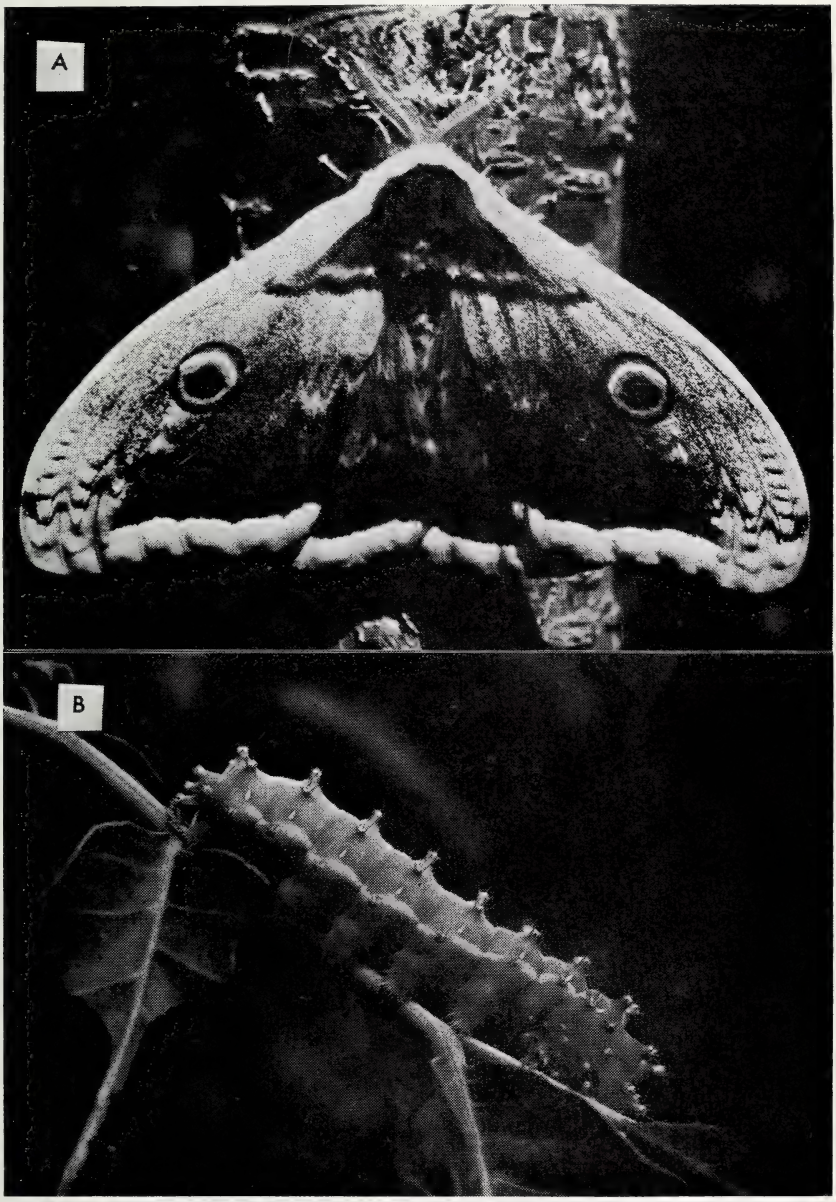

Fig. A. Adult of Great Peacock moth in resting attitude.

Fig. B. Full grown caterpillar of Great Peacock moth.

(Photos from colour transparencies by the author).

deposited, usually in chains of five or eight on the trees' branches or trunks. Examination in August has shown that 99% of these are parasitised by small wasps—perhaps they are used as a decoy, for the rest of the females precious cargo is laid in ones and twos on the lower surface of the foodplant's leaves, which here in central Europe consists, first and foremost, of Walnut, then Cherry, Blackthorn and Almond. In the southern part of its range the choice is greater, encompassing Pear, Apple, Quince, Peach, Olive, Ash, Elm, Birch, Poplar, Willow, Lilac, Plane, etc.

Compared to the eggs of other moths these take rather a long time to hatch, up to four weeks, when black larvae with light-brown tubercles are produced. In the blazing sun of this region, the larvae alternate frenzied eating with bouts of sun-worship, which, by early August, produces the beautiful fully grown "worm": apple green with large sky-blue tubercles, topped by a long, black, clubbed hair near the retractable head.

From the third instar onwards many larvae exhibit a kind of "Wanderlust", feeding at one spot for about four days then wandering off along the branches to a new spot. This may be of advantage, for in its latter stages great quantities of foliage are consumed leaving only bare twigs, which may give the larva's presence away.

Eventually feeding stops and the caterpillars turn a plum-brown against which the pale-blue tubercles virtually light up. After internal cleansing they descend en-mass to pupate at the tree's base, but only if grass grows right up to the bark. Bare ground prompts them to wander off into the surrounding vine gardens to find suitable quarters. However, in Italy it has been observed that pupation is high up in the tree along some convenient branch.

Anyone rearing this species in captivity cannot expect larvae or adults of the same size as their wild counterparts, for direct sunlight and no disturbance are an optima.

One interesting point arising from the study of this species is that although a great many ova are parasitised, very few larvae are: even out of 50 cocoons looked at only 4% were infested with larval hymenoptera, probably a *Pteromalus* species, while a further 4% had perished at the hands of fungi or accidents.

Some of the adult behaviour described above is derived from observations on wild-stock moths released in my London back garden, during May in both 1974 and 1975.

A. R. Pittaway (4802)

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AES BULLETIN No. 313

EDITORIAL

The year 1976 has seen the mounting of a 'Save Europe's Wetlands' campaign. Just how successful or otherwise this has been it is difficult to judge, but one of the main factors that requires changing is for there to be complete reversal of present Government policy. As they did with downland ploughing grants, so the Government has been paying speculators to destroy wetlands and the disastrous effects of this policy have been fully brought home to roost by the prolonged dry periods of the last two years. It is not sufficiently appreciated how areas of marsh and bog, overflowing rivers and salting, act as a buffer to drought; when large enough they contain sufficient moisture to form morning mist and dew which helps keep the surrounding area moist. Very large areas can evaporate to form rain clouds and so recirculate the water. Wetlands are of great import to Entomologists and, if one stops and thinks, a significant proportion of our extinct species used to occur in them and it is now pretty evident that one of the reasons for the present decline of the Swallowtail is primarly a drying out of its habitats. It really is absurd that we should be exhorted to save water on the one hand while on the other hand a handful of people are being paid to get rid of it, not only at other people's tax expense, but also at the cost of their enjoyment of the facilities provided by wetlands. Even the filling in of ponds is a disaster for the thousands of insects and other animals and plants which normally live in and around such an environment and entomologists who become aware of such actions should complain vociferously in the right quarters. The more of us who do so, then the better the chance of more wetlands being saved.

CONSERVATION OF BRITISH INSECTS

Report of the Society's Representatives on the Joint Committee for the Conservation of British Insects for 1975-1976.

Since my last report the usual three meetings of the Committee have been held. The Following were some of the matters discussed. The conservation of *Acosmetia caliginosa* Hbn. (Reddish buff moth) now apparently confined to only a small area in the Isle of Wight was considered as was the present status of *Maculinea arion* L. (Large blue) and the work being carried out by Dr. J. Thomas. Through his investigations it now seems certain that the cause of the insect's decline has been discovered. As members will know already, our butterfly is the only invertebrate now protected by Government legislation in the Conservation of Wild Creatures and Wild Plants Act of August 1975.

They will also have seen in their Bulletin that with but one or two exceptions all the entomological dealers have co-operated in producing a Code of Conservation Responsibility and a Red List giving the names of certain species of Lepidoptera that will not be traded. This is a pleasing example of mutual co-operation and illustrates what can be done in this direction.

It is regrettable to have to report that the Forestry Commission contacted the Committee about an incident involving one of our members who, when approached by a forester in Kingspark Wood, Sussex about him collecting without a permit, was abusive. Unfortunately efforts to trace this truculent individual have proved unsuccessful but it might not be inappropriate to remind those of our members wishing to collect on Forestry Commission property that they should always obtain a permit to do so beforehand.

Concerning proposed introductions which are occasionally reported to the Committee it will interest members that *Papilio machaon* L. (The Swallowtail) has been re-introduced to Wicken Fen, Cambridgeshire from Norfolk stock. Attempts at re-establishing colonies of *Endromis versicolora* L. (Kentish glory) and *Euphydryas aurinea* Rott. (Marsh fritillary) in locations where these once occurred have also been made.

Surveys of rare species have continued—that of *Carterocephalus palaemon* Pallas (Chequered skipper) has shown that this butterfly continues to thrive in Scotland and to even extend its range while in the Midlands not even one specimen has been observed where the insect seemed to have disappeared completely during the last few years.

The Odonata survey is continuing and has already produced some interesting results and observations.

The appropriate agenda and minutes of meetings have continued to be sent to Dr. D. Lonsdale, the Secretary of our Society's Conservation Group, so that, at least, he has been kept informed about matters of immediate interest.

T. G. Howarth (1627)

EXTINCTION OF LARGE BLUE SOLVED

The Large blue, *Maculinea arion* L. has been declining for very many years and it is now on the verge of extinction with perhaps only fifty examples still alive in one or two localties.

The reasons for its decline have been much argued about. Finally the cause has been discovered and we hope that this discovery will lead, by proper management, to the building up of the minute population still left. It may be too late and as we swelter in the June weather we think that this is just the sunny climate that should suit the diurnal sexual and ovipositional activities of *arion*. But it may also be too dry for it. Moisture helps keep the adults alive.

The prime cause of the Large blues' decline has been discovered by Dr. Jeremy Thomas of the Terrestrial Ecology Unit of the Nature Conservancy who gave a talk on his researches to the Cambridge Natural History Society earlier this year. The sequence of events is extremely simple. Lack of grazing causes lack of the right Ant and wrong Ant means no Blues. Dr. Thomas is to be congratulated on the painstaking research he has done over the past few years in digging out this, far from obvious, story which does lay once and for all the decline of this and other butterflies rather firmly at the feet of changing agricultural practices. It is so easy to notice the lack of such a conspicuous object as a colourful blue butterfly, but who has cast these eyes downward and failed to notice the substitution of brownish coloured ant A with brownish coloured ant B. How on earth, one is inclined to wonder, did the Large blue get on in this country before the Romans came over with their rabbits to keep its habitats shaven. Or did it? An intriguing question! The story unfolded by Dr. Thomas is as follows.

The Large blue butterfly is univoltine and requires hot dry weather during its flight-time when the eggs are laid on flowering heads of thyme, the flowers and developing seeds of which are eaten by the young larvae. They then drop to the ground, secrete a sugar attractive to Ants by means of a special gland on their backs and wait to be picked up and carried into an ants nest. Once there they feed on the grubs of the ants in exchange for their sugar secretion. Hibernation occurs in the nest and pupation takes place at or near the surface of the ground in spring: the butterfly emerges and the cycle is repeated. Several things are necessary such as a sufficiency of thyme and of ants. The ant par excellence for *arion* is *Myrmica sabuleti* Meinert which only occurs on arid slopes where the turf has been grazed very short, less than 3 cms in fact much like a well kept lawn. As soon as the average turf length exceeds this length the *M. sabuleti* ants are replaced by *M. scabrinodis* Ngl. a species which can still be used by *arion* but nothing like so successfully. Other ants such as *M. ruginodis* Nyl. and *M. rubra* L. may also take over as the average turf length increases and these species are of no use to *arion*. An examination of former localities of the Large blue revealed that some fifty of them contained plenty of thyme for oviposition but the turf height was too high too suit the right ant. On the other hand a site with a low thyme population, but low turf and complete ant coverage had a healthy *arion* population whereas another site with masses of thyme but only 50% ant coverage had a declining *arion* population.

These discoveries of Dr. Thomas, who we hope will publish his results *in extenso* where they can be seen by all Entomologists and Conservationists alike, explain why so many previous attempts at Conservation of the Large blue have failed. As long ago as 1929 the Royal Entomological Society leased the best *arion* site in the country, fenced it and kept out collectors but, as we now know, also kept out grazing animals, and

within eight years the Blues had gone. One of the finest experiments exonerating the collector from the overcollecting theory of extinction ever conceived as it turned out. More recently in the 1960's extensive planting of thyme was undertaken on a few sites where its decline had been noted as a result of myxamatosis destroying the rabbit populations. The turf length continued to grow however and the butterflies to decline.

That ecological factors are a prime cause in the decline of other species has also been demonstrated by Dr. P. Dempster, also of the Terrestrial Ecology Unit, who has shown that the failure of introduced Swallowtails, (*P. machaon* L.) to survive on Wicken Fen is due to the fact that their foodplant *Peucedanum* is no longer capable, under the drier conditions now prevailing, to overtop the surrounding vegetation and is not then found and oviposited upon by females. Research along similar lines with other scarce species continues and our good wishes go to all members of the Terrestrial Ecology Unit in their enterprising and painstaking work.

Brian O. C. Gardiner (225)

REARING THE SLOE PUG AND OTHER MOTHS

The Sloe Pug, *Chloroclystis chloerata*, Mabille, was first noted in Britain by Pelham-Clinton in 1972, and has subsequently been found widely distributed over most of Southern England. The first Kent specimens were recorded by B. K. West in 1974, and as a resident in Kent I was much encouraged by this news, and decided to search for this moth during 1976 at my local collecting grounds near Orpington. The literature informed me that the larvae could be "beaten from blackthorn blossom in April" and that they were "whitish-green with a red dorsal line normally interrupted in the middle".

Armed with this information (and a beating tray) I selected some likely-looking clumps of blackthorn (*Prunus spinosa*) and commenced operations. It was immediately obvious that searching the tray for small larvae was not a practical proposition, due to the mass of materiial that soon accumulated. Beatings were therefore transferred to plastic bags for later examination. On arrival home, the bags were seen to be seething with small creatures. Vast numbers of spiders, beetles, flies and small Hymenoptera spilled onto the kitchen table as I opened the bags. Naturally, I was rapidly ejected from the kitchen. The best way to 'clean-up' the blossom is to spread it thinly in seed trays, and allow surplus material to escape. The next problem was what to do with the beatings? Clearly it would be an impossible task to search the material for small larvae, but if placed in a closed box they were sure to go mouldy, and in an 'open' box would soon dry out. Under these circumstances my usual tactic is to spread the material about 1½" deep in plastic, 2 litre ice-cream containers (often available cheaply from shops that sell ice-cream in 'scoops'). The containers are then covered in that most useful of materials

—discarded ladies tights. As the blossom dries out, the larvae (in theory at least) climb to the top of the box in search of fresh food, when they can be 'harvested' and transferred to smaller containers with fresh food. This normally takes several days, and a careful watch must be kept for small spiders which crawl out of the blossom. Large numbers of larvae were obtained in this manner. Most commonly found were the bright green larvae of the Tortrix *Hedya pruniana,* Hubn. and the ubiquitous Brimstone Moth, *Opisthograptis luteolata,* L. Less common were the larvae of the Short-Cloaked Moth, *Nola cucullatella,* L. These are very easy to rear, but when ready to pupate they spin well camouflaged cocoons on the twigs of foodplant, and are easily overlooked when cleaning out the boxes. After eight days the first two *chloerata* larvae appeared. They did not strike me as "whitish-green", but rather as "whitish". One had a nearly complete dorsal stripe, and the other had a clearly interrupted stripe. They fed for a couple of days on blossom and leaves, spun up in tissue paper, and died. A third larva got as far as pupating before it died, and a fourth larva looked distinctly green, with a complete dorsal stripe. This beast pupated successfully and eventually produced a male Green Pug (*Chlorocystis rectangulata,* L.) Thus my success in rearing *chloerata* so far had been NIL. On the bright side, a fine batch of Brimstone moths were feeding up, and a couple of *Udea prunalis* D & S. had appeared, together with some *Ditula angustiorana,* Haw.

On 14th May I was about to clear away the long abandoned boxes of blossom when a fresh female *chloerata* was noticed at rest on top of the box. Over the next couple of weeks a further eight examples of this Pug emerged from the dried up blossom, together with a small number of *Argyresthia albistria,* Haw. and a second *rectangulata.* The lesson was clear—NEVER discard material until after the normal emergence time of your desired moth. This is the normal procedure when rearing 'micros', but is not often the case with the larger moths.

Quite often it does not seem worth keeping old foodplant—for example I collected a batch of *Mompha ochraceella,* Curtis, larvae this spring. They feed in the roots and lower stems of Great willowherb (*Epilobium hirsutum*) forming a cocoon in the upper part of one of the lower leaves. The stems of this species of willowherb are thick and fleshy, and soon start to decompose. By the time I had noticed and removed half a dozen cocoons, the whole mass was quite smelly, regardless of efforts to dry it out. Despite this, for every moth to emerge from a 'salvaged' cocoon, several others emerged successfully from the rotting mass of stems.

On balance, there seems to be no credit due to me for rearing *chloerata* in this manner—perhaps some of our members could be persuaded to write a note on the techniques for successful breeding and rearing of this and other Pugs?

P. A. Sokoloff (4456)

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BLOOD-SUCKING MOTHS

I am indebted to Mr. L. McLeod (3534) for calling my attention to the blood-sucking Noctuidae. I was under the impression that the fruit-piercing moths represented the highest development of the proboscis. However, as McLeod states: —"the blood-sucking habit has the advantage of allowing adult moths to feed throughout the year, and not just when fruit is ripe" which is clearly a further development from fruit-piercing.

Apparently species concerned are *Calyptera eustrigata* Hmpsn., *Arcyophora silvatica* Buttiker (a recently named species), and *Lobocraspis griseifusa* Hmpsn.

C. eustrigata has been found to be a blood-sucker in Malaya (Anon 1973), "thrusting its dagger-like tongue through the hides of buffaloes and quite ready to take human blood if given the chance". *A. silvatica* and *L. griseifusa* in Cambodia are also known to ingest blood, which has been proved by dissection, but have mostly been found feeding on the lachrymal secretions of bovines at night. In South Africa, however, the genus *Arcyaphora* seems to be confined to the latter diet.

Strangely enough, according to Buttiker (1959) "very little irritation seems to be caused on their hosts by these insects".

The feeding habits of *Arcyophora* are summarised by Reid (1954) but I have not been able to gain access to it. This applies also to Banziger (1968).

B. R. Stallwood (1547)

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AN ENTOMOLOGICAL DAY

We all have our little peculiarities and entomologists are no exception. There is our fellow collector who, unmoved by the spring Brimstone or the Green tiger beetle, will set upon the minutest of insects with what we suspect to be excessive enthusiasm. Then there is the other who, equipped with an enormous rucksack, which does indeed contain the kitchen sink (well at least a bowl for sorting samples), jumper, jacket, and wellington boots, on what turns out to be the hottest day of summer, hurries to tell us, with the impatience that his youth demands, that he has taken on another Order. Yet another companion has an overriding preference for watery habitats for he is always to be found in ditches, the existence of which we did not suspect. We take his protestation, "I fell in by accident",

as an indication of modesty concerning his knowledge of such places and help him back to dryer ground. We think of times when we too would have leaped fence, ditch and dyke during the chase while our quarry, taking neat advantage of the wind, made its escape over the river.

But let us cheer up for today we have with us the tyro, newly initiated into the entomological arts. Alas! His immaturity is revealed. With disregard for his elders he finds, alone, the best insects of the day. Never mind we have our non-entomological companion as well, how could we have left him behind on such a glorious day? Although he is tiring of the tree stump that we have been examining for only an hour and a half, he knows it is his duty to help with the search and sets about the best bit, which we had been saving until last, with such gusto that distribution of the insects throughout the woodland is ensured. Perhaps his sense of duty is misplaced and we suggest that he might look for other promising sites. We lend him some tubes to strengthen the argument. Our Dipterist companion shouts in a voice betraying hysteria, "Perhaps you could take Jack with you", and Jack, a dog of the shiny black variety, of dubious parentage but with boundless energy runs once more around the luckless collector, secures another fly in his mouth, makes a victory circuit, then, with an ear which would so like to answer the call of, "Come on Jack", he is dragged by nose and eyes towards a diminutive rabbit. Is that sobbing we hear? Could a man who secures his Tabanids not by the flat of his hand but with the net break down so easily? The tears must surely be in joyful praise of the courage of that small creature.

It is time for lunch; we are not mean, sandwiches made for three will serve for four and we would not see anyone go short of tea, but to complain that it has too much sugar is surely uncivil! There is a slight stir as someone asks, "What do adders look like", and a shape disappears from near our feet. The afternoon's passing is measured by an insect hum. In a frantic bid for a jewel set in brambles we rip our net, why didn't we bring a spare? For the rest of the day the best 'captures' manage to find the holes. We net and we tube confident of the rarities being taken. But we are really no match for our insects. Beetles jump when their capture seems so certain, a bee, flying in a line so straight that it can only be imagined, somehow eludes the net, a moth flutters weakly through the trees but is gone, a butterfly feeds out of reach . . . but we are content with our captures.

That evening we start the setting; pins, glues, boards and tapes at the ready. In an attempt to preserve the yellow of a hoverfly we almost gas ourselves but the creature is finally set, just another pin to finish it off, and that pin surely does so as it slips in the forceps and rips off a wing. Let's try a beetle—nearly set—is it up to yesterday's standard? But one of yesterday's beetles has crawled off its card! Supper is passed and we take some insects off their boards. Too late we remember that the antennae were set under the tapes! Carefully a fly is taken from its board

—just a little more—but as if impalement is not enough the pin turns into a spring and cruelly dismembers the body.

It is almost dark, time to do some mothing and, as the light fades, the collectors present a strange spectacle. An unfamiliar moth settles on the illuminated sheet and impatient to box it we catch only our foot and the apparatus collapses to the ground. Our non-entomological friend, anxious to witness the nocturnal activities, is still with us. He has liberally sugared the nearby trees and, it seems, himself. The walking bait complains of midges around his head and moths in his shirt. He presents us with a fistful of de-scaled insects and we hope that they were all common types! Soon after midnight a car draws up—there have been reports of strange lights in the wood. We convince the strangers that we are harmless although they are not so sure of our sanity! But their presence has broken the night spell; a wind clears the sky and the moths vanish. Tomorrow we will tell how our light attracted two large coppers. Each then goes his own way but soon we will be together again and then what creatures will we find?

Brian Coles (3533)

BOOK REVIEWS

BUTTERFLY CULTURE by J. L. S. Stone and H. J. Midwinter, pp. 104; 16 cold. plates. Blandford Press 1975. Price £2.60.

In spite of the title, a substantial part of this book embraces the breeding of a number of other insects, in particular spiders and other exotica. The book starts off with general rearing instructions and illustrates some simple cages which can be made. This is followed by a chapter on butterflies some twenty of which are gone into in detail, mostly British species. Then follows a chapter on some thirty mainly foreign moths. Next there is a hotchpotch of a collection on spiders, scorpions, sticks and mantids and a concluding chapter on preparing and preserving set specimens; this section usefully contains the names and addresses of half-a-dozen suppliers of livestock. To our mind this last chapter is superfluous in a book of this nature and too much emphasis is given to biological and ecological data, or just plain chat, about the very limited number of species mentioned. More condensation and sticking to breeding facts coupled with an expansion in the number of species is needed. Those which have been selected would appear to be those with which the authors have had personal acquaintance and in view of the very small number of butterflies discussed the title is somewhat misleading. Nevertheless the book contains much information and makes interesting reading. The sixteen colour plates contain 44 illustrations and are obviously designed to whet the potential insect breeder's appetite. The quality of reproduction is better than in some much more expensive books.

Although published last year, this book has only just (mid 1976)

filtered through to the bookshops and is put out in an attractively printed yellow cover showing a Gulf fritillary feeding. To the beginner, young or old, a useful starter.

B.O.C.G.

GRZIMEK'S ANIMAL LIFE ENCYCLOPEDIA. Vol. 2. INSECTS, edited by G. M. Narita. pp. 1-643; including many coloured pages and line diagrams. Crown 4to. Van Nostrand Reinhold Co. New York. 1975. Price £12.00.

Although called the English Edition this book is American thro and thro and its usefulness is therefore of limited value to the British reader. Particularly offending to the eye is the spelling of 'color' and and use of L as an abbreviation in the middle of a sentence for the word large.

Many of the line diagrams, inset into the inner margins of the pages are concise, useful and relevant to the clarity of the often murky text. The coloured illustrations, from one to a dozen on a page, vary from the artistic dioramic of "Animals of the forest floor of central Europe", one of the folding pages, through the poorly drawn, to the best that modern colour photography and printing can produce. Taken as a whole they are poor in presentation and quality, and are obviously designed to catch the eye of and appeal to the uninitiated in Entomological matters.

After a preliminary account of insects in general we are taken through the orders chapter by chapter. The emphasis is on biological data, not classification, and there is little doubt there are a lot of useful facts to be found. The selection is of the larger showier and commoner species. It is an appalling indictment of publishers in general that although the described insects number threequarters of all known organisms, this enormous number is never given its proper share of published space. Grzimek's Encyclopedia comprises thirteen volumes. Three are devoted to birds and no less than four to the miniscule number of mammals, but only one to the million described insects. It is therefore very obvious that this volume is so condensed and selective as to have grave omissions, and subjects such as mimicry are dismissed in a few sentences.

About a sixth of the book is taken up by various indices. The systematic classification section is by its own admission incomplete and is really rather a waste of space. At first sight the quadrilingual section, giving in turn the common vernacular name of many insects in American, French, German and Russian would seem to be useful, to a limited extent it may be, but unfortunately there are many imperfections. Being American there is 'imported cabbage worm' instead of 'small white' and while they have got some British names correct, they have apparently never heard of others such as 'scarce swallowtail', and call *machaon* the 'common swallowtail', which makes it trying to use for the British reader. There are also several mis-translations. There may be others. For instance

Large blue in German is Schwarzflecken Blauling, not the coined word Arion-Blauling.

The whole book gives the impression of having been collated and put together by a computer with some instruction bytes missing. Practically every page contains a typographical error. There are far too many for it to be bad proof-reading. It is carelessness and sloppiness. To take some examples; The publishers could not make up their minds in what typeface to set the quadrilingual index mentioned above and it is a random mixture of ordinary and bold typefaces. In Chapter 15 there is constant confusion between butterflies and moths. In view of the clear definitions on page 329 this is quite inexcusable. On page 24 for example we have "a small butterfly, *Argyroploce variegana*", which is of course a Tortricid moth. The Scientific mis-spellings are legion. We have *Trypaonsoma* for *Trypanosoma; Apartura* for *Apatura; Ailathus* for *Ailanthus*. There are plenty of inconsistencies. Page 322 *Hyalophora cecropia*, called *Platysamia cecropia* on page 329, *Aglia tau* on page 322 and 329 has been relegated to the American genus *Hemileuca* on page 350!

For a thick heavy book the binding is very weak and unlikely to last if the book is much used. In view of this and all its careless errors the price is quite outrageous and any would be purchasers would be far better off with several of the many far better and cheaper books on the market.

B.O.C.G.

A PRACTICAL HANDBOOK OF BRITISH BEETLES, by Norman Joy. Reprinted 1976 by E. W. Classey Ltd., in 2 volumes. 622 pp. 170 plates. Price £30.

When I was a young boy I remember the excitement occasioned by the visits of the late Dr. N. H. Joy to visit my father at Ditchling to discuss items for the original publication of this important work on the British Coleoptera which duly arrived at home in 1932, bright and new in its smart cloth binding. When my father died in 1967 it was heavily annotated and nearly in pieces, indicating how much use of it had been made over the years. By comparison his volumes of Fowler were in excellent condition. E. W. Classey Ltd. has again done a great service to the entomological brotherhood by reprinting this work which in recent years has become almost impossible to get hold of. The original was on thicker paper and the format was larger with wide margins, which although very useful for comments, made the two volumes quite large to handle. This reprint has reduced the type area for a page by about 10% and, by also reducing the margins, the whole is a much more manageable size. For those who do not know the work, it is arranged in a series of keys which emphasise the practical features which aid identification and these form the thicker Volume 1, while the line illustrations which complement the text are in Volume 2, so that the two can be studied side by side. In my opinion this work is an essential handbook for the British coleopterist and armed with this and our own new edition of the

Coleopterist's Handbook, published last year, the novice and the initiated will have a sound basis for the pursuit of their hobby. Congratulations to E. W. Classey Ltd. for making the combination possible.

P. W. Cribb

THE NATURE TRAIL BOOK OF INSECT WATCHING, by Ruth Thomson. pp. 32, 4to. Price £1.40 (hardback); 75p (paperback). Usborne Publishing, London, 1976.

This is a pre-teenagers guide to Entomology and as such it succeeds admirably, my 10 year old daughter being absolutely thrilled with it and she is already critical about matters entomological. The book consists of a multitude of coloured illustrations accompanied by a simple descriptive text, some of which is run as a 'comic strip' with the rather unisex teacher Entomologist doing the talking. Details are given on how to breed and catch insects and how to identify the various Orders. Emphasis is laid upon watching insects in order to learn about them and a brief illustrated survey is given of the commonest insects the youngster is most likely to come across. Ideal as a Christmas or birthday present to start a budding amateur entomologist off onto the hobby.

B.O.C.G.

THE MOTHS & BUTTERFLIES OF GREAT BRITAIN & IRELAND, Vol. 1. Edited by J. Heath. Blackwell Scientific Publications Ltd. & The Curwen Press Ltd. 1975. Price £17.50.

This much-heralded and long-awaited book has now been out for some considerable time. The AES was not sent a review copy and your editor has not received any review. He has looked at a copy and it is not, to him, worth the money. I personally feel that its illustrations are the poorest that have appeared for very many years. There have appeared within the last year a number of books with absolutely superb illustrations of insects, many of them butterflies and moths. Just after the war the old 'South London' published coloured plates of microlepidoptera which were incomparably better than these. The illustrations in the 1907 edition of South's 'Moths of the British Isles' of the Hepialidae are so much better and accurate than are these in this modern book.

When Messrs. Warne, back in 1952, first published Beirne's 'British Pyralid and Plume Moths', the plates were of such poor quality there was a howl of protest from purchasers, and Messrs Warne issued a new free set of plates, which are still used in the later editions of the book. We feel that their example should be followed with 'The Moths & Butterflies of Great Britain & Ireland'. Textually this is obviously a useful and authoritative book into which a great deal of work and effort has been put and, although we understand there were difficulties over plates and corrections would have led to delay, it does seem that the ship has been spoilt for a halfpence of tar, and advise purchasers to let their views be known to the publishers, Messrs. Blackwell Scientific Publications Ltd., Osney Mead, Oxford, OX2 0LE. Editor

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LETTER TO THE EDITOR

Dear Sir,

After reading the recent article published in the Bulletin entitled the "Iris Onslaught" I eagerly awaited the replies in the next issue. You can imagine my surprise on seeing only one, then I realised that the "Iris Onslaught" was of course not worthy of much comment, being for the most part rude, if not insulting, and patronising. Mr. Bryan—the only person to have a reply published is to be thanked for expressing the indignation that must have been felt by the majority of entomologists, particularly lepidopterists, even if they disagree with Mr. Bryan and would not capture a Purple emperor.

This whole episode of course reflects the "collecting/conservation" wrangle—a topic that has aroused much comment and many printed accounts, a lot of which have done little more than inflame opinion, have been factually inaccurate, and nearly always biased in the extreme. To put the argument in perspective and to instruct future commentators I suggest everyone read the well reasoned factual understanding given by

Mr. B. O. C. Gardiner in the *Entomologists Record* (1976, Vol. 88 pp. 110-112).

It would appear that most people assume that the flora and fauna of these Islands are and can be nothing but static, unable to respond to environmental changes. In present times the most drastic changes have been man-made—clearing of forest areas in the Iron-Ages, clearing away of hedge rows on farm land recently being good examples. However to obtain an insight into the extent which our Coleopterous fauna has changed since the last glacial episode one should read papers by P. J. Osborne, Curator of the Geology Museum at the University of Birmingham, or those by Harry Kenward and others of the York University, Environmental Archaeology Department. For changes during the Quaternary, papers by the Birmingham University Quaternary Entomology group which for many years was under Professor F. Shotton, one of our leading Quaternary geologists and a keen amateur entomologist. Obviously the time scale involved in such studies is larger than the relatively short human life span, and as such changes observed in one's life time would seem gradual or slight. There is a fundamental geological principle "the present is the key to the past", perhaps we could alter this to suit our needs—"the past is the key to the present". Insect populations can and do change naturally and man can and does have some effect on them (alas often a drastic effect in modern times) by changing the environment. Surely it is not beyond the realms of credibility that some insect should become extinct in Britain through natural changes even today. (Rev. W. W. Fowler in vol. 4 of Coleoptera of the British Islands, 1890: p7, writes of *Platycerus caraboides* L. "As this genus of the Lucanidae, represented by the single species *P. caraboides,* has been included in all our old catalogues, it can hardly be passed over without notice."

"Stephens 1839 records the species as very rare in Britain, and says that 'specimens have been taken by Mr. Waring of Bristol' and others in Scotland, and that it has also occurred near Oxford, and in the west of England; I have a specimen . . . purchased from collection of the late Mr. E. Brown . . ."

The beetle thus seemed to be well distributed in these Islands long ago (presumably the specimens referred to above date from the late 18th and early 19th centuries—a time when there were but a few Coleopterists, yet the beetle was well known; it is incidentally a large blue-green beetle unlike any other British species.). It would not be unreasonable to assume that we have here a case of an insect becoming extinct in Britain; today it is to be found in old wood-land areas of Europe and Scandinavia.

We can rule out rapid evolution of species as a mechanism aiding their quick extinction. No evidence of morphological evolution has been detected in beetle remains from the British Quaternary, and the situations in which these are found are the same as those environments in which

the modern Coleopterist may expect to find live examples.

Aphodius holdereri Reiter is a striking example of an insect responding to environmental change. Its remains are abundant in certain Quaternary peats and silts in the Midlands. Today it exists not in Europe, nor Scandinavia but the Himalayan region.

There are many problems involved in conservation or outright protection, please let us get away from persecuting the collector all the time and give some thought to the complex of other factors, man made or natural. After all the majority of collectors are responsible members of the Natural History Community, are fully aware of the need to, and invariably practise restraint in their collecting.

J. Cooter (3290)

NOTES AND OBSERVATIONS

RESPONSIBLE ADULT REQUIRED TO NURSEMAID BUTTERFLY.—I have received a letter from the Divisional Manager, Eastern Region, British Railways to the effect that Butterflies, Locusts and Cockroaches will no longer be accepted unaccompanied for transit by rail; unless they originate from an accredited laboratory animal breeder. Anyone who breeds insects therefore and may have some occasion at times to send butterflies or other insects by train should, unless he intends to accompany them in person, write to the Home Office and ask as of right for accreditation. For some reason the logic of which completely escapes me, live specimens of bait (an insect! —do they know?); crustaceans, fish, shellfish and—wait for it! —water fleas may travel on their own. All, I might add, species which require a good deal more care and attention; careful packing and careful handling, than do butterflies, locusts and cockroaches which travel best in closed boxes in which they will live happily for several days.

British Rail plead incompetency to comply with the regulation of the Transit of Animals (General) Order 1973; and regretfully prefer to withdraw from the business rather than risk incurring penalties under the act. Oh what a tangled skein our politicians do weave and is there any wonder there is a "credibility gap"—EDITOR.

BOOK BARGAINS: —On June 7th last duplicate books from the Libraries of the Royal Entomological and Linnean Societies were auctioned by Sotheby's at their Bond Street premises. Although the total sum realised exceeded expectations some real bargains were picked up, as follows:

Seitz, A. Macrolepidoptera of the World. A large stock of unbound parts of all volumes, apparently complete as published up to 1939, a mere £66.

Hanstrom, Brinck & Rudebeck; South African Animal Life, 15 volumes a paltry £5.50. The new price of this work is about £175 and it does contain a large amount of Entomology.

The Zoologist. A complete and well-bound set £176. Another journal with a lot of Entomology; indeed the early issues can be said to incorporate "The Entomologist".

A mixed run of Journals, Science Academy of Cordoba, Malarial Institute of India etc., a total of 150 volumes went for £5.50 and at the same price another 100 volumes, mainly "The Living Nature" but with some Russian works thrown in for good measure.

Linnaeus' Systema Naturae, the tenth (1758-59) edition went for £33. Compare this price with that demanded for the modern reprint! One could almost say that lesser known Journals etc. are a drug on the market. Also for the price of £5.50 went two lots of 100 and 62 volumes respectively, runs of works on gardening, horticulture and farming, but containing enough of Entomological interest to whet the appetite!

Some 80 volumes which included a complete set of the Bulletin of the French Natural History Museum was also very cheap indeed at £22.

To counterbalance these bargains well over the odds was paid for some books. Nearly £50 for instance was paid for 4 volumes by Charles Darwin (*Not* first editions!) and I have seen all these in Cambridge for a tenth of this price. Ten times the estimate—£1210 was paid for the illustrations only of A. J. Roesel's "Amusing Insects Monthly Magazine".

Nearly a third of the £29,500 total realised from the Royal Entomological Society's books came from two lots, the Latin and Dutch editions of the works of Maria Sybilla Merian, which although they had the plates uncoloured and were in poor condition, realised £4,400 each. These works, together with a fair proportion of the other lots were sold abroad. In the relationship of their hard currencies to our devalued pound, the purchasers were no doubt getting some very good bargains indeed.—Brian O. C. Gardiner (225).

REARING THE CANNINGI SILKMOTH: —On the 11th August last year I ordered a dozen *Philosamia cynthia canningi* larvae; on the 22nd August they arrived in a small plastic container.

Most were in their first instar and 15 mm in length and they were sent on Ailanthus. They were yellow with black tubercles and small protruding hairs. They often remained in a hunched-up position.

They were transferred to larger plastic containers, 6 to each and were fed on Lilac leaves. Only 4 died; they were surrounded by a pool of green fluid and fed and thrived for several days before dying. In a few days the remaining larvae moulted into their 2nd instar, they were only on their silken pads for a few hours before moulting.

The larvae were white with white tubercles and black spots and a yellow head and were 25 mm in length. They were covered in waxy white powder. They were now transferred to a netting cage and were fed on Lilac and Privet and relished both. One larva moulted normally and changed colour but 'refused' to grow and lived until it was changing its

fourth skin but unfortunately it died. Perhaps it could have been a dwarf moth if it lived, one never knows!

The larvae ate arch-shaped cuts out of the leaves and ate everything except the tougher stems. They made very loud crunching noises when eating. The larvae were 70-75 mm when full grown and were bluish-white and covered in a waxy white powder, the claspers were yellow and held fast.

Before spinning they raced around the cage and emptied their guts of a brown fluid and they lost their white powder.

After finding a suitable leaf, usually a Lilac leaf, the larva spun a silken pad that bent the leaf and then the larva crawled out and spun a silken penducle around the nearest twig. When this was completed, the larva retreated back into the leaf and continued to spin the pad it had started and then curled up the far end with silk and spun silk 'criss-cross' fashion joining the leaf together and when the white silk was complete, the larva finished with silk either Brown or Orange. The cocoons are due to hatch in the spring and I have eight.—Gary King (5654J).

GOLDEN-RINGED DRAGONFLY IN FARNHAM.—On the afternoon of 10th June, 1976 I was searching the area round a small pond in a wood for Stratiomyid flies. Among very thick undergrowth about 18 inches off the ground I found the cast larval skin of a female Golden-ringed Dragonfly, *Cordulegaster boltonii* (Donovan). This species is well known for the wanderings of its larvae, but this particular specimen must have been particularly adventurous. The pond is bordered by a near vertical bank of between 2 and 3 feet. Round this runs a more or less well-trodden path and then the thick undergrowth. The skin was found six feet or so from the edge of this undergrowth.

Although the skin was in perfect condition there was no sign of the adult. In fact I have not seen this species in the neighbourhood of the pond which is only a short walk from my house.

The pond itself would seem to be a most unusual place for this species to be found. It is only 20 feet by 25 feet and has a thick layer of mud and decaying vegetable matter on the bottom. A stream, which rarely consists of more than a trickle, runs into the pond at one end and a similar stream drains it from the other. For a species which normally will only breed in running water with a sandy bottom this specimen must have been well off course.—D. H. R. Keen (3309).

BUTTERFLIES ON MUD.—Whilst observing the aerial duels of two male *Orthetrum cancellatum* L. and two male *Libellula depressa* L.—Black-lined Orthetrum and Broad-bodied Libellula dragonflies—over a pond on Odiham Common, Hampshire I noticed butterflies landing on mud surrounding the pond. Closer examination revealed that they were feeding, and as I have not seen this before feel it worth recording here.

The species involved were: Red Admiral—*Vanessa atalanta* L.; Small Tortoiseshell—*Aglais urticae* L.; Meadow Brown—*Maniola jurtina* L.; Comma—*Polygonia c-album* L. and Small Skipper—*Thymelicus sylvestris* (Poda). In addition, I noticed both White Admiral—*Ladoga camilla* L. and Purple Hairstreak—*Quercusia quercus* L. hovering over the mud, but I did not see either of them actually land.

I feel it worth mentioning that there were many dead fish, mostly Rudd (*Scardinius erythrophthalmus*) and Pike (*Esox lucius*) both in the water and on the mud. I did not see a butterfly approach a fish, but wonder if the butterflies were attracted by the presence of the dead and dying fish.

The observations were made in the early afternoon of 29th June, 1976 —a very hot day.—D. H. R. Keen (3309).

PRESERVING THE COLOURS OF DRAGONFLIES.—With reference to the account given by Mr. P. H. Williams in *Bull. amat. Ent. Soc.* 36. 311 (May 1976 Bulletin) I would like to put forward an alternative method. Methylated spirits have always given me very good results when used as follows. First catch a dragonfly—not always easy—and bring it home alive where it is killed by immersion in a small bottle or jar of methylated spirits. As soon as it is dead remove it from the meths and take out the gut. This is done very simply by cutting the underneath of the abdomen from end to end—care must be taken, however, not to damage the male accessory genitalia or the female ovipositor—and then taking out the gut. The specimen is then set UPSIDEDOWN on a piece of balsa wood or stiff cork. This is then floated, the dragonfly underneath, in a "bath" of methylated spirits. I use a plastic food cannister as the bath.

After two or three days the specimen is removed and allowed to dry before being placed in the cabinet or storebox. In this way the pattern and most of the colour is retained—even the colouring of the eyes. Damselflies can be given the same treatment except that it is not necessary to remove the gut! —D. H. R. Keen (3309).

THE HAZARDS OF MOTH HUNTING: —Most entomologists who indulge in light-trapping have their own anecdotes about the various 'horrors' that can occur during such activities. My portable M.V. trap has attracted a good series of local Constables, but in general the Police are quite understanding. As far as I know, I have only once been reported to the Police, and on this occasion was accused of 'stealing badgers'. Until recently, my worst experience was returning to the car to find it jacked-up on bricks, with two rather unsavoury characters engaged in removing the rear wheels. However, the incident which prompted this note occurred in early July this year on the North Downs at Trosley, Kent. It was nearly dark, the trap was assembled and I was just about to start the generator when there was a loud bang, and the trap was peppered

with shotgun pellets. Before I could beat a hasty retreat a Poacher appeared, inquired as to what sort of idiot I thought I was, offered me a dead rabbit to compensate for the fright, then disappeared into the gloom, leaving me to contemplate the possible attractions of stamp collecting.—P. A. Sokoloff (4456)

HELP WANTED:—For work on Noctuidae immigrant to the British Isles I should be most grateful for any unpublished accounts of the finding of *wild* larvae or pupae, with dates and later history if possible, of the following species: *A. ipsilon, P. saucia, E. occulta, M. albipuncta, M. vitellina, M. unipuncta, P. meticulosa, Spodoptera littoralis, Caradrina exigua, Trichoplusia ni,* and of any of the scarcer immigrant species.—R. F. Bretherton, Folly Hill, Birtley Green, Bramley, Guildford, Surrey GU5 0LE.

LEPIDOPTERA HIBERNATING UNDERGROUND

During the course of 1975 I visited most of the caves of the North Yorkshire Moors. Although my main aim was to survey the caves, I also recorded some of the fauna. Below is a list of the lepidoptera recorded. Due to the time of year when these caves were visited all the insects were hibernating.

CAVE	SPECIES	DATE	POPULATION
Boltby Quarry Cave	*Scoliopteryx libatrix*	2/3/75	Single Spec.
Dowson Pot	„ „	2/2/75	Several Specs.
„ „	*Nymphalis io*	9/1/76	Single Spec.
Fadmoor Cave 3	*Scoliopteryx libatrix*	2/2/75	„ „
Kirkdale Cave	„ „	22/3/75	Several Specs.
Manor Vale Caves	„ „	9/3/75	Single Spec.
Monk's Wood Cave	„ „	1/5/75	„ „
Silpho Quarry Cave	*Nymphalis io*	9/2/75	„ „
T'une Mouth Cave	*Scoliopteryx libatrix*	9/3/75	„ „

The Herald Moth was also found hibernating in caves from various areas in the Pennines. The examples below show that this moth often frequents caves in the winter months.

CAVE	SPECIES	DATE	POPULATION
The Belfry, Kinderlow, Derbyshire	*Scoliopteryx libatrix*	29/11/75	Several Specs.
Crackpot Cave, Swaledale	„ „	16/2/75	Single Spec.
Upper Long Churn Cave, Ingleborough	„ „	26/9/75	„ „

In the case of the caves in the North Yorkshire Moors they are all dry, relatively short and rarely visited by cavers. The insects could therefore hibernate in reasonably stable conditions without being disturbed. None of the lepidoptera showed any signs of having adapted to life underground and all were found within the "threshhold" zone or only a few feet outside it (i.e. the zone of maximum penetration of daylight). Most

of the caves in which the moths occurred were below 600 ft. OD., though specimens were found at 1200 ft. O.D. fairly frequently and one group (from Kinderlow) were found at about 1800 ft. OD. In all cases the moths were hibernating on the cave roof.

Kevin R. Solman (5233)

GENETICS FOR LEPIDOPTERA BREEDING

In the last article some explanation was offered on the subject of simple recessive inheritance, this being the most easily recognised form of genetic mechanism. It involves only *one* gene, consisting of two alleles, one derived from the mother and one from the father, they can be equal in effect or have different responses. The form *lanceolata* Shipp. of the butterfly *Aphantopus hyperantus* L. is a case in point, i.e. the spot shape is determined by one gene, but there are two alleles involved.

Examples occur where two different genes can work collectively to give one observed "form", one of the best examples is in *Lycaena phlaeas* L. In the form *schmidti* Gerh., the normal golden colour of the fore and hind wings is absent, and they appear as white individuals which lack pigment in these areas. This is believed to be due to a single gene, one of the alleles being dominant to the other and producing a copper wing colour (G), the recessive allele failing to give rise to any pigment (g). The *schmidtii* specimens are therefore homozygous recessives (gg) for that particular gene. Also in the same species is the form *obsoleta* Tutt., where the pigmented golden band on the hind margin is missing, this too appears to be a simple recessive situation with one gene again, the normal banded (B), being dominant to non-banded allele (b).

This can lead to an interesting situation where the two genes are being expressed independantly of one another, by virtue of their being on different chromosomes, as described in an earlier article.

In the above mentioned species there are known examples of *schmidtii* + *obsoleta,* where both these genes are showing their effects in the adult butterfly. This situation is fairly common in lepidoptera and often leads to confusion when attempting to analyse breeding results. Another seemingly confusing situation is when a gene consists of more than two alleles, thus giving rise to a wide range of phenotypes and genotypes, but where all the different forms are due to one gene. Obviously only one pair of alleles can be represented in any one individual, since the alleles are carried on chromosomes of a pair, but in the population as a whole there may be several forms of the allele. A good example of this is the yellow pigment in wings of *Pieris napi* L. which has been investigated by many amateurs and professionals alike since the early 1900's, and in some eyes, has not been fully resolved yet. The problem lies in defining the forms, as the colour appears to present a graded series from white to deep yellow, the rich yellow *citronea* Froh, is thought to be a simple recessive to the normal form (type). There are many named forms including

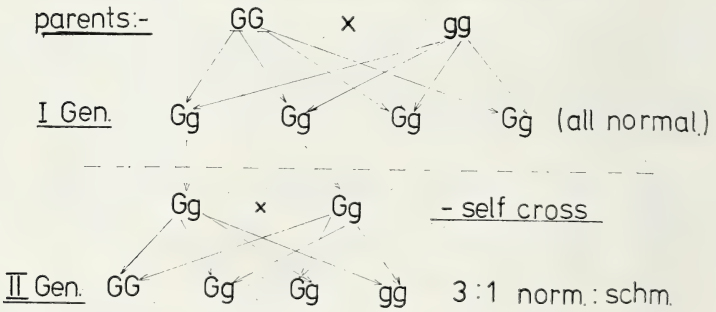
sulphurea Schoyen.; *hibernica* Schmidt.; *flava* Kane. and others, all refer to a distinct form or phenotype, all produced by the effects of *one* gene. The results of this in a breeding situation are seen as a 'dominance-series'.

FIG 1 Two genes in Lycaena phlaeas L.

GG = } normal BB = } normal
Gg = Bb =

gg = schmidtii bb = obsoleta

Considering a "schmidtii" × normal cross:-



Likewise for obsoleta; but they can be considered together, whilst segregating independantly:- ie. GgBb × GgBb normal looking parents.

Parent 2	GB	Gb	gB	gb	← Parent 1 combinations
GB	GGBB	GGBb	GgBb	GgBb	
Gb	GGBB	GGbb	GgBb	Ggbb	
gB	GgBB	Ggbb	ggBb	ggBb	
gb	GgBB	Ggbb	ggBb	ggbb	

9 norm. : 3 schm. : 3 obs. : 1 schm. + obs.

This obviously provides an extremely interesting situation for breeding, and once 'pure lines' are isolated, crosses can be made to produce any desired intermediate form at will. One of the points arising from this system is that naming a form from one specimen is rather a premature move, it being much more productive to try and breed from it and deduce its origins.

All the previous examples apply equally to either sex, but a very common case in lepidoptera is sex-limited expression, the oft quoted example being the *helice* Hubner., form of *Colias croceus* Geof.; before describing the mechanism it is essential to have an explanation of sex determination in lepidoptera. Within each individual there is a set of chromosomes the actual number of pairs being constant from individual to individual (for any given species), within these pairs one particular 'pair' is quite distinct in form from the rest, these are the so called sex chromosomes. In the male both sex-chromosomes are exactly alike, usually shown as ZZ, in the female they are different, one being reduced in size and effectively not carrying any genes, and is referred to as ZW. In the case of sex-limited expression, the character is affected by a 'normal' body chromosome gene, but on top of the dominance-recessive system is superimposed the effect of sex. The helice gene can be represented as H if "helice" allele, and as h if the normal 'wild type' allele, for *helice* is dominant to the normal white form ('h' is best represented as '+', this being a standard notation for type characters). Hence in a specimen with the genotypes HH or H+, one would expect a *helice* type of adult, but if the individual is a male (ZZ), then it will look normal, i.e. the expression is stifled in the male. Thus we have: —

H+/ZZ; HH/ZZ; + +/ZZ	all normal & male.
H+/ZW; HH/ZW.....	all helice & female.
+ +/ZW	normal & female.

This being an example of sex-limited expression of an autosomal dominant (autosomal referring to the fact that the gene is carried on a 'normal' chromosome). Also using the same idea it is possible to explain the *valezina* Esper., form of *Argynnis paphia* L., and with this in mind the *valezina* can be manipulated in the breeding situation.

Thus in summary, several types of genetic inheritance have been looked at: —

(i) One gene with two alleles, i.e. *lanceolata*
(ii) Two genes with overlapping effects, i.e. *schmidtii* & *obsoleta*
(iii) One gene with several alleles in its system, i.e. *sulphurea* system
(iv) Sex-linked expression, i.e. *helice/valezina*

These should not be thought of as the sum total of mechanisms, merely a few examples of the simpler systems, but with these in mind much can be done in the way of describing variation in a meaningful sense, and if applied in the practical field of breeding can achieve much in the way of 'vars'.

FIG 2

Allelic - Series, Hypothetical case

1 Gene with 4 alleles :-

'A' - produces deep yellow pigment ≡ 

'B' - produces pale yellow pigment ≡ 

'C' - produces cream pigment ≡ 

'D' - produces white pigment ≡ 

Order of dominance A > B > C > D

eg. possibilities :-

AA; AB; AC; AD. =  1 in 4 breed true

BB; BC; BD. =  1 in 3 " "

CC; CD. =  1 in 2 " "

DD. =  all " "

Glossary of some of the terms used: —

Alleles: Different forms of a gene all occupying the same place on equivalent chromosomes.

Autosomes: Chromosomes other than sex chromosomes.

Chromosomes: Permanent structures in a cell nucleus, carrying the genes in a linear fashion along their length.

Dominant: An allele which expresses itself in a heterozygous condition; over-rides the effect of another allele.

Gene: A material unit of inheritance carried in a linear manner on chromosomes.

Genotype: The actual alleles present in the individual, whether expressed or not.

Homozygous: Possessing an equal pair of alleles; both alleles of the same type.

Phenotype: External appearance of the individual resulting from the effect of influences on the genotype.

Recessive: Property of an allele showing only in the homozygote.

K. Porter (4505)

CROATIA AND SLOVENIA—JUNE 1975

In 1972 I had visited Jugoslavia with Mr. R. F. Bretherton and spent two weeks in Montenegro (*Bull. amat. ent. Soc.* Vol. 32 p. 76) and this year I had the opportunity of accompanying Mr. W. L. Coleridge on a further entomological trip to that country. On this occasion we chose the north, the states of Croatia and Slovenia, spending a week in each. Jugotours in London again made the arrangements for us very efficiently and we left Heathrow in a BAC 1-11 on the 16th June for Zagreb. Two and a half hours later we emerged from low cloud through rain onto the small airport and after collecting our baggage we drove off in the VW 1200 which was waiting for us. Our journey took us south west through lowlands to the new Autoceste from Zagreb to Karlovac which runs through a large forest and then into wooded hills beyond Karlovac on a well made secondary road to the National Park of Plitvice, where our first week was to be spent. We stayed in one of the hotels built in the woods above the famous lakes, the Hotel Jezero. The park is dense forest of beech and other deciduous trees covering a low mountain range and bear, wild cat, wolves and deer live in its depths. Running through the park is a deep gorge cut in the limestone which is the course of the River Korana. The river has gouged out a series of beautiful lakes starting high up and falling into each other in steps by means of spectacular waterfalls. The lakes are deep and blue and alive with trout. The limestone and other salts dissolved in the water are continually depositing tufa so that there are stalactites and a continual build up of travertine around the lakes. The lake below the hotel had meadows around the hotel side but the remainder are surrounded with woodland or steep rock so that we would

need to look elsewhere for our collecting grounds. The hotel was quite luxurious and the food, with trout on the menu, was most welcome. On the next morning I watched a family of Hawfinches from the bedroom balcony, an unusual bird in England, and a pair of Greater Spotted Woodpeckers but the weather was overcast with clouds right down on the mountains so we decided to explore the plain. Our first problem was that the car battery was flat and on examination we found that there was no water in it. I managed to collect up some rain water from a puddle on the tarmac and with a friendly push we got away. This was the way we had to start each morning until we moved on from Plitvice. The run down to the lower land is only a short distance and we crossed over the Korana by a high bridge and turned off towards the small town of Bihac.

We collected along the roadsides where scrub and heaths grew and found everywhere the Silver-studded Blue, *Plebejus argus* L., and a few *Lycaeides agyrognomon* Berg. Limestone pervades the whole of the area and vetches and trefoils occur in patches, the Horseshoe vetch, *Hippocrepis comosa* L., being common and with it were several fresh specimens of *Lysandra bellargus* Rott., our Adonis Blue. I also found small larvae of *L. coridon* Rott., the Chalkhill Blue, by moving the tufts of vetch. A few newly emerged male Meadow Browns, *Maniola jurtina* L., were on the wing and despite our being so far south, the butterflies on the wing appeared to be those that were now out back in England, an indication that this was probably a late season and our visit looked like being too early for a lot of things we had hoped to find. Most of the lowland that is not forest or woodland is cultivated, either by means of strip arable land or for hay. Ploughing is still done with bullocks and the grass is cut with scythes, so close as to appear shorn. Haymaking was in full swing and as we found in Montenegro, the intensity of agricultural activities, based on a peasant community, gives little chance for insects to thrive. Throughout our stay we were to find that only rough slopes, woodland glades or areas of scrub were at all rich in insects and many of the wonderful flowery meadows, soon to be laid low, were almost insect deserts as far as butterflies were concerned. The farm houses are built alongside the roadsides so that one has the impression of ribbon development and never quite being away from people. We spent the day exploring odd meadows along the way to Bihac, seeing a Hoopoe and a large number of Hooded Crows. By a quiet stretch of the River Korana we listened to a chorus of Marsh Frogs which I first thought to be large birds croaking—the noise is quite startling. Through and above Bihac where the road petered out into a dirt track we found some fine meadows where I caught a large Green Lizard for Coleridge and we found quite an assortment of butterflies flying. These included *C. arcania* L., *C. pamphilus* L., the Skippers—*O. venatus* Brem. et Grey, *E. tages* L., *P. malvae* L., *S. sertorious orbifer* Hueb. and the Blues—*P. icarus* Rott., *C. semiargus Rott.* and *C. minimus* Fuessl. Just emerging were dozens of male Black-veined Whites, *A. crataegi* L., and among the trees at the bottom of the slope I took what I believed to be our first Fenton's Wood White, *Leptidea morsei* Fenton. It was larger than usual and had the faint hook at the sixth vein. Later we took several and also *L. sinapis* L. and were able to compare the two species. The day flying moth the Burnet Companion, *Ectypa glyphica* L., was abundant everywhere and there must have been thousands of them on the wing wherever we went in the meadows during our trip. Rose Beetles, *Cetonia* sp., were common on the dwarf Elder and I took a specimen of the small green Tiger Beetle, *Cicindela germanica* L. Another insect found in every meadowland was the Field Cricket, *Gryllus campestris* L. These called incessantly, going silent at one's approach. They are quite ventriloquial but after a while I became adept at locating them and finding the little burrows into which

they retire. These usually go in a short distance and then run off at an angle. With a knife I was able to find the end of the tunnels and drive the occupant out into a pill-box. I put a male and female into one box hoping to get a pairing and next morning found the remnant of the male and a fatter female. A consuming passion. In the evening back at the hotel I wandered along the lake side where the trout were taking large Ephemeroptera as they came to the surface to take wing. I flicked a chafer on to the water to see it disappear in a swirl. One is allowed to fish the middle lakes but only with a spinner and as the water was thick with Minnows I doubt that many are caught by the fisherman who pay 30 dinar a day for the privilege. In the foyer of the hotel was a large stuffed European bear and although we did not see any wild ones in our travels, we did see two in a village chained and muzzled. There were other stuffed exhibits including Badger and Capercaillie.

The next day the weather showed us how beautiful these forests can be —the sun shone from a clear sky and we drove up the winding road which skirts the gorge to beyond the topmost lake. Here we found some alpine meadows full of flowers and the finest area for butterflies that we discovered in our two weeks. Thirty-four species were on the wing including a lot of the Small Apollo, *Parnassius mnemosyne* L., which were as large as I have ever seen. *Colias australis* Verity males quartered the area and I took a male and female *Zerynthia polyxena* Schiff. The commonest butterfly was *Erebia medusa* Schiff. in both sexes, large and well marked and we also took *Pieris ergane* Geyer, and some large *Hamearis lucina* L. After spending some time here we drove on over the pass towards Vrhovine where we stopped by some rough meadows and took an assortment of Fritillaries, *Melitaea didyma* Esp., *M. trivia* Schiff. and *Brenthis hecate* Schiff. and the largest and brightest Large Walls, *Lasiommata maera* L., I have seen. The road led on to a fork and we took that towards Senji passing through the town of Catocac. On the slopes above the village we found *Mellicta aurelia* Nick. flying commonly. It is smaller than *M. athalia* Rott. but has similar flight habits though it seems to prefer open terrain rather than woodlands and their fringes. *Plantago* spp. were widespread and were probably the foodplant. I caught another Green Lizard and we drove the 60 Km. back to the hotel in brilliant evening sunshine. The next day saw the clouds down on the forest again so we drove down to the entrance to the lower lakes and explored several, walking on the wooden cat walks over the water. The waterfalls are most spectacular and the water of the lakes deep and blue. Later in the day we drove down towards the town of Slunj and collected by sweeping in the meadows. Here the very dark form of *Melanargia galthea* L., form *procida* Herbst. was common and we also added the Coppers *Heodes alciphron* Rott. and *Palaeochrysophanus hippothoe leonhardi* Fruhst. and found this method of collecting in poor weather quite effective although the nets became wet. Beyond Slunj we drew off

the road onto what appeared to be a sandy lay-by but when I tried to move the car we found the back wheels had sunk into a soft sandy clay. We really were stuck but managed to hail a passing truck and the driver turned round and came back to haul us out with a steel hawser. He refused to take money for helping us and muddy and very relieved we collected in the meadows below the road. The evening sun came out and I saw a large blue butterfly sunning itself. It turned out to be a perfect male *Maculinea alcon* Schiff. and as I always associate this butterfly with its initial foodplant, *Gentiana cruciata,* I searched for and found several clumps of it, all of which were liberally spattered with the eggs of the butterfly. It seemed quite common in the vicinity and we took a short series. Another surprise was the summer form *prorsa* of *Araschnia levana* L. and we also took *M. athalia* and *Callophrys rubi* L. In the trees by a farmhouse we heard the Golden Oriole and the Wryneck calling and I found a shallow pond which was full of large Golden Carp and Edible Frogs.

The weather continued dull on the next day and we had a look round Slunj and did some shopping. The shops are mainly co-operatives selling agricultural implements, food and liquor. The Catholic church was obviously used and cared for and there was a large stone memorial panel of the workers' struggle in the village square. These memorials are common about the countryside. In the afternoon we took some very large Plecoptera by the River Korana and added *Nordmannia ilicis* Esper and the Fritillary, *Brenthis daphne* Schiff. to the score. I also took a female Fox Moth, *Macrothylacia rubi* L., and some specimens of *Syntomis phegea* L. with some assorted Burnets on the grasses. The weather did not appear to be improving and we decided we would move on to our second area, the village of Kranskja Gora in the Julian Alps of the state of Slovenia.

(To be continued.) P. W. Cribb (2270)

MIGRATION RECORDS

The long hot summer drought of 1976 proved to be an excellent year for various migrants and reports of Camberwell beauties from Kent to the Isle of Man have appeared in the National Press. Rumours and verbal reports of various species have reached your editor from many sources. All those received by him in writing (or from personal knowledge) are published below.

CONVOLVULUS HAWKS SEEN:—

I recorded *Herse convolvuli* L. in my garden at Batheaston, Bath, on the evenings of 14th, 15th and 16th of August 1976. The moth arrived at precisely 10 minutes past eight each evening and fed on *Nicotiana* (Sweet tobacco) flowers.—Bryan W. Moore (4344)

While spending a holiday with my Grandfather, Mr. T. H. Fox (105)

in Littlehampton, Sussex, on Sunday morning, August 29th, at about 8.30 a.m. we went out to close the front gate, which had, as usual, been left open by the milkman. To our great surprise and delight, there on the side of the gate, was a perfect specimen of a female Convolvulus hawk moth. We transferred it straight into a hanging cage, with some wild convolvulus and a cotton wool pad of sugar water, where it stayed without moving all day.

No eggs have yet been laid and we do not know of course, if it had paired, but we are still waiting hopefully, as it is a strong insect perhaps attracted by the Tobacco plants which are flowering in the front garden. —Alexander Fox (5540J)

DEATHS-HEAD—AND ON AN UNUSUAL FOODPLANT.

On August 12th 1976 a half-grown *Manduca atropos* L. larva was given me by a non-Entomological friend which he had found feeding on, of all things, Lettuce, in a garden near Daventry, Northants. So far as I know this is the first occasion *atropos* has been recorded as feeding on a non-Solanaceous plant. Perhaps I should now concentrate my efforts looking at lettuce plants, as my yearly slog around the local spud fields has so far been fruitless. This in the first British born larva I have ever seen in my ten years of Entomological hobbying, but I understand one was seen in the Daventry area eight years ago:—K. F. Williams (5396)

CAMBERWELL BEAUTIES:—

I wish to report that I saw a *Nymphalis antiopa* L. on 20th August in Bishops Stortford. I have been advised by Mr. G. Sell of the Bishops Stortford and District Natural History Society that this sighting would be of interest to you:—R. W. Stroud

It is apparently over seventy years since *antiopa* was last recorded in Cambridgeshire. In 1976 the first record came from Mrs. Pumphrey who saw one in Grantchester Road Cambridge on August 1st. The second sighting came on September 7th when Mrs. Simpson rang me to say she had one feeding, amongst other things, on her Buddleia at Pampisford:—B. O. C. Gardiner (225)

I should like to record the capture on 3rd September 1976 of a Camberwell beauty at Carshalton, Surrey. It was caught by 13-year-old Sean Clancy a member of the Grosvenor Young Naturalists' Society.

The specimen, which was rather worn, was taken in the cemetery of Carshalton Parish Church a short distance from where our society has met for the past twenty-one years. Sean brought it to me for inspection and I promised that I would endeavour to have it recorded in the appropriate quarters. I know that there have been several such records this year but have not heard of another in this locality:—F. C. Brown (2414)

OVIPOSITION OF THE CAMBERWELL BEAUTY BUTTERFLY (NYMPHALIS ANTIOPA LINN.)

This is an addendum to the article which appeared in *Bull. amat. Ent. soc.* Vol. 34 (pp. 30-34), from which will be found supporting information.

The specimen illustrated above was the one noted laying on 11.5.74 in southern Finland at 62°N., 23°E. The time was 13.00 hrs and the temperature 13-15°C. There was a moderately strong breeze blowing.

Leigh Plester (2968)

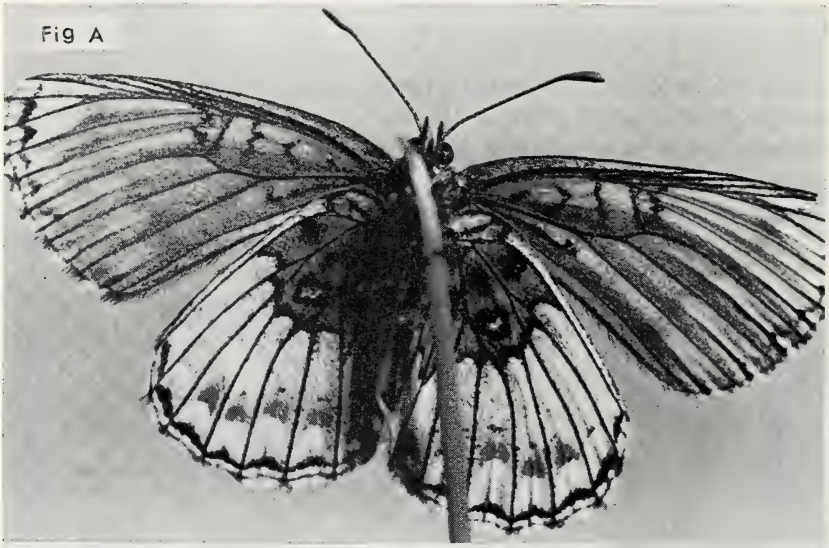


Fig A


Fig B

TWO ABERRATIONS OF THE HEATH FRITILLARY, MELLICTA ATHALIA ROTT. OBSERVED IN FINLAND

Fig. A Female. 30.6.75. Near Tampere, South-Häme. 62°N., 23°E. On recently cleared area with part-grown forest, feeding from wild raspberry flower (*Rubus idaeus*). Markings on upperside also very faint. L. Plester leg.
Fig. B Female. 1.7.73. Near Tampere, South-Häme. 62°N., 23°E. In flight along dirt road through mixed forest. Extreme black borders to discal spots. L. Plester leg.

BEDSTRAW HAWKMOTH IN NORFOLK:—On the night of 5th July 1975 the rare migrant *Hyles gallii* (Rottemburg) was caught feeding at the flowers of viper's bugloss, *Echium vulgare* L., in the Breckland forest of Thetford Chase, near Mundford in Norfolk.—Sarah A. Corbet.

ANNUAL GENERAL MEETING

This will take place in Caxton Hall, Westminster, on Saturday March 26th 1977. Please note date and come if you possibly can.

ENTOMOLOGY IN THE WET TROPICS
A WORD OF WARNING

To many entomologists the words "wet tropics" and "tropical rainforest" conjure up the vision of an insect paradise—the entomologist's mecca. This picture is often enhanced by television naturalists who emphasise and touch up the high spots while playing down the difficulties. It is of course true that the rainforests do breed insects in profusion but it is a myth to believe that the observation, photography and collection of them is either easy or pleasant. While the rewards are great (in terms of insect size and numbers) there are a number of attendant pitfalls which any entomologist preparing to work in such localities should be aware of.

Firstly, and most obviously, there is the climate. The high humidities of the wet tropics make day excursions both arduous and debilitating. After a couple of hours working through the bush the body is soaked in sweat, the head begins to swim, the initial enthusiasm is soon dissipated and one longs for the ease of a hammock in a fly-free shade and a long, cold drink. Anyone who tries to walk or work the bush trails in the midday sun (i.e. anytime between 10.00 hrs. and 16.000 hrs.) courts sunstroke and heat exhaustion neither of which are very pleasant. Coupled with this and exacerbating the discomfort are the flies. Continually present, hovering and whining around ones head are the mosquitoes—biting and threatening to bite they make rainforest entomology a nightmare of frustration. One has always to keep a hand free to swat and slap them before they get a chance to pierce and even with the greatest vigilance

one can end up with scores of bites on the head, neck and hands on a bad day. The commercial preparations made to dissuade them from their blood meal are only partially effective against them when they occur in such numbers and are rendered completely useless when the pouring sweat dilutes the chemical allowing it to run into the eyes and mouth where it burns quite effectively.

I have found that one can make the best of a bad job by wearing loosely fitting clothes (no shorts!) and to learn to carry out essential operations with one hand holding in the other a wet flannel—a dual purpose tool being both a fly swat and sweat remover.

Sweating is considerably increased by rapid movement (a common enough operation for the entomologist) but apart from this running has other dangers. Such movement in the bush itself is impossible as one needs a machete or panga to cut a way through (and you won't get far in an hour!) and relatively unimpeded movement is confined to the bush trails and local farms. However due to the nature of subsistence farming (milpa, chitemene, etc.—depending upon your tropics) the ground is strewn with innumerable stumps and trunks generally obscured by the low level vegetation and any contact at speed with such an object is likely to lead to severe dislocation of the vertebrae or other skeletal deformations—no laughing matter when one may not see another person all day.

Nor do the problems end there. Many entomologists like to dig around and in rotten timbers, termite nests and under decaying vegetation and too often in the rainforests the only result is the disturbance of hundreds of ferocious biting ants which quickly transfer themselves to one's person with obvious repercussions or a lethargic scorpion (which isn't too bad if you spot him first) or even worse an angry snake whose toxic abilities one is never too sure of unless one happens to be something of an expert on tropical snakes. At a higher level (so to speak) the disturbance of leaves will often upset the domestic tranquility of any number of vicious species of wasps and hornets whose sting is exceedingly painful (and has been known to be fatal) and whose aim and direction are always unerring.

So do not make the mistake of thinking that collecting in the wet tropics is a bed of hibiscus and flamboyants. Lepidopterists and dipterists place your trust not so much in the net but in the baited trap; Coleopterists wear good gloves when dealing with the likely stump. All should carry out excursions in the early morning or late evening and go equipped with a proven fly repellent; a good wide-brimmed hat and a machete; spares for the vehicle and the light trap; a fly swat and a small first aid kit and if you are going out in the night double all precautions, know your locality well (all trails and trees look the same in the dark) and carry a partner.

This may all sound very ominous and alarmist but I speak from

personal experience. I have been lost in the bush of Central America for many hours at night only being saved by the moonlight being reflected from the chrome of my motorcycle: I have been struck down by heat exhaustion and bitten by mosquitoes almost to the point of craziness and many times have been surprised by meeting snakes falling from overhanging trees or staring at me from inside bromeliads. Then there were the times I found myself standing on ants nests and having hurriedly removed my clothes then allowed the mosquitoes areas of attack normally denied them or was forced to run several hundred yards pursued by inflamed hornets until being pitched forward by contact with a hidden tree trunk so that the hornets could then inflicate punishment at will.

Of course there is the other side of the whole business when the giant Morphos and Caligos and the enormous Longicornia and Buprestids repay the hours of agony and frustration and in retrospect it was amusing and well worth it but for those going to the wet tropics it pays to be forewarned.

Peter Ashdown (2823)

A LIST OF THE FOODPLANTS OF EAST AFRICAN MACROLEPIDOPTERA

PART 2—MOTHS (HETEROCERA)

(Continued from page 100)

Dilophonotinae

Cephonodes hylas L. — Spathodea (Bignoniaceae) : Adina, Burchellia, Coffea, Gardenia, Hymenodictyon, Ixora, Kraussia, Pavetta, Vangueria, Oxyanthus formosus (Rubiaceae).

Philampelinae

Deilephila nerii L. — Mangifera (Anacardiaceae) : Acokanthera, Adenium, Carissa, Conopharyngia, Ervatamia, Holorrhena, Nerium, Picralima, Rauwolfia, Tabernaemontana, Thevetia, Vinca, Voacanga (Apocynaceae) : Bambusa (Gramineae) : Apodytes (Icacinaceae) : Jasminum (Oleaceae) : Burttdavya, Cinchona, Gardenia, Mitragyna (Rubiaceae). Despite definite records of Rubiaceae as food-plants, all incidentally eaten by *Nephele* spp., I think Pinhey's record of Gardenia is due to misidentification of Tabernaemontana, also Jasminum and Mangifera for Landolphia and Conopharyngia (all Apocynaceae). Le Pelley's record of Bambusa is almost certainly wrong.

Nephele funebris F. — Landolphia (Apocynaceae).

„ *bipartita* Btlr. — Landolphia (Apocynaceae).

„ *discifera* Karsch — Funtumia (Apocynaceae).

„ *vau* Wlk. — Carissa (Apocynaceae).

„ *argentifera* Wlk. — Carissa, Landolphia (Apocynaceae).
„ *comma* Hpffr. — Carissa, Diplorhynchus (Apocynaceae) : Anthonotha macrophylla (Caesalpiniaceae).
„ *accentifera* Beauv. — Carissa (Apocynaceae) : Crytostegia (Asclepiadaceae) : Ficus (Moraceae).
„ *rosae* Btlr. — Burttdavya, Mitragyna, Nauclea (Rubiaceae).
„ *aequivalens* Wlk. — Funtumia elastica (Apocynaceae), Macrolobium macrophyllum (Caesalpiniaceae), Chrysophyllum albidum (Sapotaceae). (In West Africa.)
Temnora fumosa Wlk. — Camelina (Cruciferae).
„ *zantus* H.S. — Apodytes (Icacinaceae) : Strychnos (Loganiaceae) : Burchellia (Rubiaceae).
„ *natalis* Wlk. — Strychnos (Loganiaceae).
„ *pseudopylas* Roths. — Leucas (Labiatae) : Pentas (Rubiaceae).
„ *pylades* Roths & Jord. — Leucas (Labiatae) : Anthospermum (Rubiaceae).
„ *marginata* Wlk. — Psychotria (Rubiaceae).
„ *livida* Holl. — Harungana madagascariensis (Hypericaceae) : Psychotria (Rubiaceae). (In West Africa).
„ *funebris* Holl. — Psychotria (Rubiaceae). (In West Africa).
„ *sardanus* Wlk. — Psychotria (Rubiaceae).
Alemnora westermannia Bsd. — Strychnos (Loganiaceae).
Macroglossum trochilus Hon. — Galium, Rubia (Rubiaceae).
Leucostrophus hirundo Gerst. — Strychnos (Loganiaceae).
Sphingonaepiopsis nana Bsd. — Galium (Rubiaceae). (In West Africa) : Oldenlandia (Rubiaceae).
„ *ansorgei* Roths. — Oldenlandia (Rubiaceae).

Choerocampinae

Euchloron megaera L. — Ampelopsis, Vitis (Ampelidaceae).
Basiothia medea Feld. — Richardia (Aroideae) : Oldenlandia, Pentas, Pentansia, Spermacoce (Rubiaceae) : Verbena (Verbenaceae).
„ *charis* Bsd. — Vernonia (Compositae).
„ *aureata* Karsch — Impatiens (Balsaminaceae).
Celerio lineata L. — Vitis (Ampelidaceae) : Aloe, Bulbine (Liliaceae) : Boerhavia (Nyctaginaceae) : Rumex (Polygonaceae) : Portulaca (Portulacaceae) : Prunus (Rosaceae) : Galium, Oldenlandia (Rubiaceae) : Antirrhinum (Scrophulariaceae) : Valeriana (Valerianaceae).
Hippotion osiris Dalm. — Cissus, Vitis (Ampelidaceae) : Richardia, Anchomares difformis (Aroideae) : Impatiens (Balsaminaceae) : Spathodea (Bignoniaceae) : Ipomoea (Convolvulaceae) : Fuchsia (Onagraceae) : Oxygonum (Polygonaceae).
„ *celerio* L. — Cissus, Vitis (Ampelidaceae) : Arum, Caladium, Cryptocoryne, Anchomanes difformis (Aroideae) : Impatiens

(Balsaminaceae) : Beta (Chenopodiaceae) : Convolvulus (Convolvulaceae) : Sorghum, Zea mays (Gramineae) : Glossypium (Malvaceae) : Boerhavia (Nytaginaceae) : Rumex (Polygonaceae) : Spermacoce (Rubiceae).

Hippotion eson Cr. — Ampelopsis, Vitis (Ampelidaceae) : Arum, Amorphophallus, Anchomanes difformis, Caladium Richardia (Aroideae) : Impatiens (Balsaminaceae) : Fuchsia (Onagraceae) : Paullinia pinnata (Sapindaceae). Pentas spp. (Rubiaceae).

„ *balsaminae* Wlk. — Impatiens (Balsaminaceae) : Jussiaea (Onagraceae). Anchomares difformis (Aroidea) : Ipomea spp. (Convolvulaceae).

„ *roseipennis* Btlr. — Cissus (Ampelidaceae).

„ *rosae* Btlr. — Cissus (Ampelidaceae).

Theretra capensis L. — Ampelopsis, Cissus, Rhoicissus, Vitis (Ampelidaceae).

„ *monteironis* Btlr. — Arum, Richardia (Aroideae).

„ *jugurtha* Bsd. — Vitis (Ampelidaceae).

„ *orpheus* H.S. — Roots of Aerangis, Polystachya (Orchidaceae).

Centroctena rutherfordi Druce — Ipomoea cairica (Convolvulaceae).

„ *imitans Btlr.* — Cissus, Rhoicissus (Ampelidaceae).

N.B. Generic and specific names after Carcasson's *Revised Catalogue of the African Sphingidae (Lepidoptera),* Nairobi 1968.

EPIPLEMIDAE

Dirades theclata Guen. — Burttdavya nyasica (Rubiaceae).

THAUMETOPOEIDAE

Thaumetopoea apologetica Strand — Maerua (Capparidaceae).

Anaphe reticulata Wlk. — Grewia (Tiliaceae).

„ *venata* Btlr. — Syzgium guineense (Myrtaceae).

„ *infracta* Wals. — Cynometra alexandri (Caesalpiniaceae) : Bridelia micrantha (Euphorbiaceae) : Triumfetta macrophylla (Tiliaceae).

NOTODONTIDAE

Scalmicauda griseomaculata Gaede — Brachystegia (Caesalpiniaceae).

„ *niveiplaga* Hamps. — Bridelia micrantha (Euphorbiaceae).

Peratodonta heterogyna Hamps. — Albizia (Mimosaceae).

„ olivacea Gaede — Markhamia platycalyx (Bignoniaceae).

Pygaera roseitincta Janse—Faurea saligna (Proteaceae).

Ptilura argyraspis Holl.—Allophylus africanus: (Sapindaceae).

Pectinophora noctuiformis Janse—Pseudarthria (Papilionaceae).

Cerura marshalli Hamps. Doryalis hebecaepa Dovyalis sp. (Flacourtiaceae) : Populus wislizenii (Salicaceae).

Desmeocraera pergrisea Hamps.—Combretum (Combretaceae).

„ *varia* Janse—Acacia cyanophylla (Mimosaceae) : Eucalyptus, Psidium guajava (Myrtaceae).
„ *confluens* Gaede—Psidium guajava (Myrtaceae).

Sizalisca graminosa Wlk.—Erythrina abyssinica (Papilionaceae).

Rhenea mediata Wlk.—Dioscorea (Dioscoreaceae).

Phalera lydenburgi Dist.—Zea mays, Grasses generally (Gramineae).

Alenophalera variegata Auriv.—Erythrina (Papilionaceae).
„ *duplicata* Gaede—Erythrina poeppigiana (Papilionaceae).
„ *inconspicua* Gaeda—Teramnus micans (Papilionaceae).
„ *punctata* Gaede—Pycnanthus angolensis (Myrtaceae).

Amyops gigas Dist.—Terminalia (Combretaceae).

Hoplitis excellens Strand—Grewia (Tiliaceae).

Scrancia accipiter Schaus.—Sapium ellipticum (Euphorbiaceae).
„ *modesta* Holl.—Canarium schweinfurthii (Burseraceae).

Macrasenta longicauda Holl.—Aframomum sp. (Zingiberaceae).

Diasemina simplex Wlk.—Alysicarpus, Cajanus cajan, Canavalia, Desmodium, Phaseolus, Pseudarthria, Rhynchosia (Papilionaceae).

Antheua tricolor Dist.—Grasses generally (Gramineae).

Rigema ornata Wlk.—Carex (Cyperaceae) : Pennisetum purpureum, Grasses generally (Gramineae).
„ *wordeni* Snell.—Cyperus (Cyperaceae).

Ramesa macrodonta Hamps.—Tephrosia (Papilionaceae).

LIMACODIDAE

Cosuma rugosa Wlk.—Alchornea cordifolia (Euphorbiaceae).

Micraphe lateritia Karsch—Bauhinia (Caesalpiniaceae) : Ricinus (Euphorbiaceae) : Syzygium cumini (Myrtaceae).

Ctenolita anacompa Karsch—Terminalia catappa (Combretaceae) : Gmelina aborea (Verbenaceae).
„ *pyrosomoides* Holl.*—Quisqualis latiolata (Combretaceae).

Ctenocompa hilda Druce—Acalypha, Manihot glaziovii (Euphorbiaceae) : Setaria longiseta (Gramineae) : Psidium guajava (Myrtaceae).

Baria elsa Druce*—Anthonotha macrophylla (Caesalpiniaceae) : Terminalia catappa (Combretaceae) : Alchornea cordifolia (Euphorbiaceae) : Gmelina arborea (Verbenaceae).

Paryphanta fimbriata Karsch—Ipomoea batatas (Convolvulaceae) : Alchornea cordifolia (Euphorbiaceae).
„ *bisecta* Btlr.—Phyllanthus (Euphorbiaceae).

Zinara ploetzi Schs. & Clem.*—Alchornea cordifolia (Euphorbiaceae) Clerodendron splendens (Verbenaceae).
„ *nervosa* Wlk.*—Anthanotha macrophylla (Caesalpiniaceae) : Alchornea cordifolia (Euphorbiaceae).
„ *recurvata* Hamps.*—Alchornea cordifolia (Euphorbiaceae).

Neothosea aurifrons B.Bak.—Alchornea cordifolia (Euphorbiaceae) : Coffea, Ixora degemensis (Rubiaceae).

Stroteroides nigrisinata Strand—Alchornea cordifolia (Euphorbiaceae) : Aframomum sp. (Zingiberaceae).

Hadraphe aprica Karsch*—Berlinia (Caesalpinaceae).

Narosa africana Hering — Bridelia micrantha (Euphorbiaceae) : Lagerstroemia (Lythraceae) : Coffea (Rubiaceae).

„ *flaccidia* Druce—Coffea arabica (Rubiaceae).

Hyphorma subterminalis Hamps.*—Alchornea cordifolia (Euphorbiaceae).

Coenobasis albiramosa Wlk.—Acacia mearnsii (Mimosaceae).

Latoia (*Parasa*) *karschi* Dyar—Lagerstroemia speciosa (Lythraceae) : Musanga cecropioides (Moraceae).

„ *latistriga* Wlk.—Barringtonia speciosa (Lecythidaceae) : Syzygium cumini (Myrtaceae) : Sideroxylon diospyroides (Sapotaceae) : Lagerstroemia indica (Lythraceae) : Ochna (Ochnaceae).

„ *trapezoides* Auriv.—Ricinus (Euphorbiaceae).

„ *urda* Druce—Markhamia platycalyx (Bignoniaceae) : Coffea (Rubiaceae).

„ *vivida* Wlk.—Spondias mombin (Anacardiaceae) : Quisqualis (Combretaceae) : Ipomoea batatas (Convolvulacea) : Ricinus (Euphorbiaceae) : Zea mays (Gramineae) : Gloriosa superba (Liliaceae) : Gossypium (Malvaceae) : Arachis hypogaea (Papilionaceae) : Pyrus malus (Rosaceae) : Coffea arabica, Mitragyna stipulosa (Rubiaceae) : Markhamia (Bignoniaceae).

„ *chapmanni* Kirby—Markhamia platycalyx (Bignoniaceae) : Eucalyptus deglupta (Myrtaceae).

„ *viridissima* Holl.—Sapium ellipticum (Euphorbiaceae) : Musa sapientum (Musaceae) : Cocos nucifera (Palmae) : Rosa (Rosaceae) : Citrus (Rutaceae).

„ *hexamitobalia* Tams—Markhamia platycalyx (Bignoniaceae) : Coffea (Rubiaceae).

„ *viridicosta* Hamps.—Markhamia platycalyx (Bignoniaceae) : Ficus (Moraceae).

Latoiola albipuncta Holl.—Alchornea cordifolia, Sapium ellipticum (Euphorpiaceae) : Ficus (Moraceae) : Syzygium guineense (Myrtaceae) : Prunus africana (Rosaceae).

„ *brunnea* Holl.—Sapium ellipticum (Euphorbiaceae).

Trachyptena nigromaculata Hering*—Cassia (Caesalpiniaceae).

Phorma pepon Karsch—Burttdavya nyasica, Coffea (Rubiaceae).

Neomoncena syrtis Schs. & Clem.—Aspilia latifolia (Compositae) : Alchornea cordifolia (Euphorbiaceae) : Lagerstroemia speciosa (Lythraceae).

„ *convergens* Hering—Ricinus (Euphorbiaceae) : Corchorus (Tilliaceae).

Niphadolepis alianta Karsch—Annona (Anonaceae) : Lagerstroemia (Lythraceae) : Rosa (Rosaceae) : Coffea arabica (Rubiaceae) : Camellia sinensis (Theaceae).

„ *bipunctata* Hering—Coffea (Rubiaceae).

Miresa coccinea Hamps.— Coffea arabica (Rubiaceae).

„ *melanosticta* B.Bak.—Terminalia (Combretaceae).

Prolatoia perileuca Holl.*—Alchornea cordifolia (Euphorbiaceae) : Nepeta (Labiatae).

Cochlidion cretacea Holl.*—Alchornea cordifolia (Euphorbiaceae).

Narosan agbaja B.Bak. *Spondias mombin (Anacardiaceae).

Casphalia extranea Wlk.*—Spondias mombin (Anacardiaceae).

N.B. I have no records of the East African occurrence of the species marked *, but seeing the very wide distribution of the Heterocera, particularly the forest-haunting species, there seems no reason why they should not occur there.

PSYCHIDAE

Clania cervina Druce—Ozoroa mucronata (Anacardiaceae) : Bauhinia, Cassia javanica (Caesalpiniaceae) : Combretum Quisqualis, Terminalia (Combretaceae) : Cupressus (Cupressaceae) : Sapium ellipticum (Euphorbiaceae) : Barringtonia speciosa (Lecythidaceae) : Lagerstroemia (Lythraeceae) : Hibiscus (Malvaceae) : Acacia mearnsii (Mimosaceae) : Crotalaria (Papilionaceae) : Duranta (Verbenaceae).

Eumeta rougeoti Bourg.—Schinus molle (Anacardiaceae) : Cupressus (Cupressaceae) : Acacia mearnsii (Mimosaceae) : Eucalyptus (Myrtaceae).

Acanthopsyche junodi Heyl.—Cupressus (Cupressaceae) : Acacia decurrens (Mimosaceae) : Eucalyptus bridgesiana, E. saligna (Myrtaceae).

„ *alba* Janse—Coffea (Rubiaceae).

„ *sierricola* White—Vernonia (Compositae) : Maesopsis eminii (Rhamnaceae).

„ *reimeri* Gaede—Delonix regia (Caesalpiniaceae).

Psyche aethiops Hamps.—Acacia mearnsii (Mimosaceae) : Pinus radiata (Pinaceae).

„ *vuilloti* Oberth.—Quisqualis (Combretaceae) : Acacia (Mimosaceae).

Chalia emiliae Heyl.—Coffea (Rubiaceae).

Monda bicolor Strand—Gerbera jamesoni (Compositae).

„ *rogenhoferi* Heyl.—Coffea (Rubiaceae).

Manatha microcera Bourg.—Acrocarpus fraxinifolius (Caesalpiniaceae).

THYRIDIDAE

Dysodia lumida Whalley—Maerua angolensis (Capparidaceae).
„ *lutescens* Whalley—Capparis Ritchiea (Capparidaceae).
Plagiosella clathrata Hamps. Bridelia micrantha (Euphorbiaceae).

METARBELIDAE

Salagena irrorata Le Cerf) Podocarpus gracilior (Podocarpaceae).
„ *discata* Gaede)
„ *atridiscata* Hamps.—Markhamia platycalyx (Bignoniaceae) : Gossypium arboreum (Malvaceae) : Albizia (Mimosaceae) : Citrus (Rutaceae).
Metarbela vau-alba Hamps.—Hibiscus (Malvaceae).
Melisomimas metallica Hamps.—Erythrophloeum guineense (Caesalpiniaceae) : Acacia, Piptadenia africanum, Samanea saman (Mimosaceae).

N.B. The last species has recently been transferred from the Zygaenidae.

All species are bark-feeders.

AEGERIIDAE

Tipulamina pyrostoma Meyr.—Ipomoea batas (Convulvulaceae).
Trilochana phaedrastoma Meyr.—Cordia ovalis (Boraginaceae).
Aegeria aericincta Meyr.—Ipomoea batatas (Convolvulaceae).
„ *citrura* Meyr.—Hibiscus cannabinus (Malvaceae).
„ *leptomorpha* Meyr.—Albizia chinensis, A. glaberrima (Mimosaceae).
Idiopogon uranopla Meyr.—Cordia ovalis (Boraginaceae).

N.B. All species are internal feeders.

COSSIDAE

Azygophlebs inclusa Wlk.—Indigofera (Papilionaceae). In roots.
Xyleutes crassus Drury—Cassia (Caesalpiniaceae).
„ *capensis* Wlk.—Cassia (Caesalpiniaceae) : Ricinus (Euphorbiaceae) : Abutilon, Hibiscus (Malvaceae).
„ *nebulosa* Don.—Acrocarpus fraxinifolius, Caesalpinia decapetala, Cassia grandis, C. siamea (Caesalpiniaceae).
Phragmatoecia pallens H.S.—Pennisetum purpureum (Gramineae). In roots.
Eulophonotus myrmyleon Feld.—Combretum (Combretaceae) : Populus (Salicaceae) : Theobroma cacao (Sterculiaceae : Celtis (Ulmaceae).
Gymnelema leucopasta Hamps.—Grasses Gramineae). In roots.

N.B. All species are internal feeders.

AGARISTIDAE

Heraclia superba Btlr.—Pentas bussei (Rubiaceae).

Hespagarista echione Bsd.—Amorphophallus schweinfurthii, Caladium, Colocasia Gonatopus boivinii and other Aroideae.

NOCTUIDAE (Arranged after Seitz).

Acronyctinae

Craniophora paragrapha Feld.—Olea welwitschii (Oleaceae).

Mominae

Elaeodes brevicornis Wlk.—Pinus patula (Pinaceae) : Pteridium aquilinum (Polypodiaceae).

„ *prasinodes* Prout—Various Ferns (Polypodiaceae).

Euxoinae

Euxoa longidentifera Hamps.—Allium cepa (Amaryllidaceae): : Raphanus sativus (Cruciferae) : Oryza sativa, Zea mays (Gramineae) : Gossypium (Malvaceae) : Eucalyptus (Myrtaceae) : Phaseolus (Papilionaceae) : Nicotiana tabacum, Solanum tuberosum (Solanaceae).

„ *cymograpta* Hamps.—Zea mays (Gramineae) : Gossypium (Malvacee) : Coffea (Rubiaceae) : Solanum tuberosum (Solanaceae).

Agrotis ypsilon Rott.—Zea mays (Gramineae).

„ *bisignata* Hamps.— Coffea (Rubiaceae).

„ *spinifera* Hbn.—Zea mays, Pasture grasses (Gramineae) : Coffea (Rubiaceae) : Nicotiana tabacum (Solanaceae).

„ *segetum* Schiff.—Chrysanthemum (Compositae) : Brassica oleracea (Cruciferae) : Zea mays (Gramineae) : : Gossypium (Malvaceae) : Pisum sativum (Papilionaceae) : Rumex (Polygonaceae) : Coffea arabica (Rubiaceae) : Nicotiana tabacum (Solanaceae).

Lycophotia muscosa Geyer—Nicotiana tabacum (Solanaceae).

„ *ablactalis* Wlk.—Hymenocallis (Amaryllidaceae) : Markhamis platycalyx (Bignoniaceae) : Buddleia polystachya (Loganiaceae).

Hadeninae

Polia consanguis Guen.—Grasses generally (Gramineae).

„ *dipterigidia* Hamps.—Coffea (Rubiaceae).

„ *fuscirufa* Hamps.—Linum usitatissimum (Linaceae),

„ *inferior* Guen.—Zea mays (Gramineae) : Nicotiana tabacum (Solanaceae).: I cannot trace this species in either Seitz or Hampson's *Catalogue of the Lepidoptera Phalaenae*.

Odontestra albivitta Hamps.—Gynura ruwenzoriensis (Compositae) : Clematis hirsuta (Ranunculaceae).

Hadena fuscirufa Hamps.—Bidens pilosa, Galinsoga parviflora (Compositae). The species does not appear in either Seitz or in Hampson's *Catalogue;* possibly an error for *Polia fuscirufa* Hamps.

Brithys pancratii Cyr.—Crinum, Haemanthus, Hippeastrum, Zephyranthes carinata (Amaryllidaceae) : Lilium, Ornithogalum sordidum (Liliaceae).

Diaphone eumela Cr.—Crinum, Hippeastrum (Armaryllidaceae) : Ornithogalum sordidum (Liliaceae) : Musa sapientum (Muscaceae) : Amomum (Zingiberaceae).

„ *lampra* Wlk.—Amaryllis (Amaryllidaceae) : Albuca, Anthericum (Liliaceae).

Polytelodes florifera Wlk.—Gloriosa virescens (Liliaceae).

Cirphis nebulosa Hamps.)
„ *prominens* Wlk.) Grasses generally (Gramineae).
„ *tincta* Wlk.)
„ *atrimacula* Hamps.)

„ *loreyi* Dup.—Allium cepa (Amaryllidaceae) : Panicum maximum, Zea mays, Grasses generally, Sorghum (Gramineae).

„ *insulicola* Guen.) Pennisetum (Gramineae).
„ *pyrastis* Hamps.)

Mythimna phaea Hamps.—Grasses generally (Gramineae).

Borolia torrentium Guen.—Grasses generally (Gramineae).

Cucullinae

Cucullia perstriata Hamps.—Microglossa (Compositae).

Empusada argentivitta Hamps.—Vernonia (Compositae).

Amphipyrinae

Magusa versicolora Saalm.—Cassia (Caesalpiniaceae).

Stenopterygia subcurva Wlk.—Ochna squarrosa (Ochnaceae). (Indian record).

Parastichtis nigricostata Hamps.—Harungana madagascariensis (Hypericaceae).

Trachea consummata Wlk.—Nicotiana tabacum (Solanaceae).

Perigea capensis Guen.—Cineraria, Coreopsis, Cynara, Laggera alata (Compositae).

Diparosis castanea Hamps.—Gossypium (Malvaceae) : Pinus patula (Pinaceae).

„ *gossypioides* Clem.—Gossypioides kirkii (Malvaceae).

Eriopus maillardi Guen.—Various ferns (Polypodiaceae).

„ *latreillei* Dup.—Adiantum concinnum (Polypodiaceae).

Delta phoenicraspis Hamps.—Syzygium cordatum (Myrtaceae).

Cetola puchra B.Bak.—Cordia (Boraginaceae) : Ocimum (Labiatae) : Lantana (Verbenaceae).

Spodoptera littoralis Bsd.—Helianthus annuus (Compositae) : Ipomoea batatas (Convolvulaceae) : Brassica oleracea (Cruciferae) : Cucurbita pepo (Cucurbitaceae) : Cupressus lusitanica (Cupressaceae) : Dillenia indica

(Dilleniaceae) : Manihot esculenta, Ricinus (Euphorbiaceae) : Zea mays (Gramineae) : Gossypium, Abelmoschus esculentus (Malvaceae) : Eucalyptus saligna (Myrtaceae) : Arachis hypogaea, Phaseolus vulgaris, Pisum sativum, Vigna unguiculata (Papilionaceae) : Phytolacca dodecandra (Phytolaccaceae) : Pinus khasya (Pinaceae) : Maesopsis eminii (Rhamnaceae) : Coffea (Rubiaceae) : Lycopersican esculentum, Nicotiana tabacum (Solanaceae) : Verbena (Verbenaceae) : Anacardium occidentale (Anacardiaceae) : Boerhavia elegans (Nyctaginaceae).

„ *exigua* Hbn.—Zea mays, Grasses generally (Gramineae) : Gossypium (Malvaceae) : Pisum sativum (Papilionaceae) : Coffea (Rubiaceae).

„ *triturata* Wlk.—Zea mays, Grasses generally (Gramineae).

„ *cilium* Guen.—Grasses generally (Gramineae) : Nicotiana tabacum (Solanaceae).

„ *exempta* Wlk.—Digitaria scalarum, Eleusine coracanus, Hyparrhenia rufa, Sorghum, Zea mays, Grasses generally (Gramineae) : Phaseolus (Papilionaceae) : Coffea (Rubiaceae) : Capsicum (Solanaceae).

Athetis atriluna Guen.—Nicotiana tabacum (Solanaceae).

„ *pigra* Guen.—Ipomoea batatas (Convolvulaceae).

Ariathisa semiluna Hamps.—Keith Brown writes 'Believed to feed on' Cupressus lusitanica (Cupressaceae) : Pinus patula (Pinaceae).

Ethiopica micra Hamps.—Grasses generally (Gramineae).

Eulymnia pulcherrima Hamps.—Azanza garckeana (Malvaceae).

Busseola fusca Hamps.—Panicum maximum, Pennisetum, Saciharum officinarum, Sorghum vulgare, Zea mays (Gramineae).

„ *phaia* Bowden—Pennisetum purpureum (Gramineae).

„ *segeta* Bowden—Panicum maximum, Pennisetum purpureum (Gramineae).

„ *sorghicida* Thu.—Sorghum (Gramineae).

Sesamina botanephaga Tams & Bowden—Vossia cuspidata (Gramineae).

„ *calamistis* Hamps.—Eleusine coracan, Oryza sativa, Pennisetum purpureum. Saccharum officinarum, Sorghum, Zea mays (Gramineae) : Gossypium (seed) (Malvaceae).

„ *cretica* Led.—Zea mays (Gramineae).

„ *poebora* Tams & Bowden—Pennisetum purpureum (Gramineae).

„ *poephaga* Tams & Bowden—Sorghum, Zea mays (Gramineae).

Senta bertha Schaus.—Hyparrhenia diplandra (Gramineae).

Mazuca strigicincta Wlk.—Markhamia platycalyx, M. zanzibarica, Fernandoa magnifica (Bignonioceae).

Chasmina tibialis F.—Grewia (Tiliaceae).
Callyna figurans Wlk.—Cordia (Boraginaceae).
Procus ambigua Wlk.—Carex (Cyperaceae) : Coarse Grasses (Gramineae), feeding internally.

Melicleptriinae

Chloridea obsoleta F.—Justicia (Acanthaceae) : Cleome (Capparidaceae) : Dianthus caryophyllus (Caryophyllaceae) : Chrysanthemum, Helianthus annuus (Compositae) : Pelargonium (Geraniaceae) : Eleusine coracanus, Pennisetum, Sorghum, Zea mays (Gramineae) : Calamintha (Labiatae) : Gossypium, Hibiscus cannabinus, Abelmoschus esculentus (Malvaceae) : Eucalyptus torelliana (Myrtaceae) : Cajanus cajan, Cicer, Crotalaria, Lablab purpureus, Phaseolus, Pisum sativum, Vigna unguiculata (Papilionaceae) : Reseda (Resedaceae) : Rosa (Rosaceae) : Coffea arabica (Rubiaceae) : Antirrhinum (Scrophulariaceae) : Lycopersicon esculentum, Nicotiana tabacum (Solanaceae). Prefers the flowers and unripe seeds. Anacardium occidentale (Anacardiaceae) : Lactuca sativa (Compositae).
„ *assulta* Guen.—Physalis peruviana (Solanaceae).
„ *peltigera* Schiff.—Arenaria (Caryophyllaceae) : Pyrethrum (Compositae) : Ononis (Papilionaceae).
Adisura atkinsoni Moore—Hibiscus mutabilis (Malvaceae). In fruits.

Erastriinae

Eublemmistis chlorozona Hamps.—Lichens on tree trunks. Hampson (*Catalogue*), quoting Leigh, gives Coccids, but my larvae unquestionably fed on Lichens.
Eublemma scitula Rmbr.—Coccids.
„ *apicimacula* Mab.—Ipomoea, Stictocardia (Convolvulaceae).
„ *snelleni* Wllgrn.) Asparagus (Liliaceae).
„ *postrufa* Hamps.)
„ *decora* Wlk.—Albuca, Ornithogalum (Liliaceae).
„ *admota* Feld.—Solanum melongena (Solanaceae).
„ *apicipuncta* Saalm.—Microglossa (Compositae).
„ *aurantiaca* Hamps.—Solanum tuberosum (Solanaceae).
„ *brachygonia* Hamps.—Panicum, Sorghum, Zea mays (Gramineae). Eats unripe seeds and tassels.
„ *chlorochroa* Hamps.—Solanum incanum (Solanaceae).
„ *olivacea* Wlk.—Solanum hirsutissimum, S. melongena (Solanaceae).
„ *ornatula* Feld.—Helianthus annuus (Compositae).
„ *ragusana* Freyer—Gossypium (Malvaceae).
„ *rufimixta* Hamps.—Ceratophyllum demersum (Ceratophyllaceae) : Dracaena (Liliaceae).

Lophoruza semiscripta Mab.—Zea mays (Gramineae) : Coffea (Rubiaceae). Not in Seitz nor in Hampson's *Catalogue*.
Ozarba rosescens Hamps.—Acanthus (Acanthaceae).
„ *perplexa* Saalm.—Asystasia (Acanthaceae).
Amyna punctum F.—Croton (Euphorbiaceae).
Ilattia octo Guen.—Celosia (Amarantaceae) : Beta vulgaris, Chenopodium (Chenopodiaceae).
Tarache antica Wlk.—Abutilon (Malvaceae).
„ *zelleri* Wllgrn.—Sida (Malvaceae).
„ *nitidula* F.—Gossypioides kirkii (Malvaceae).
„ *apatelia* Swinh.—Gossypium (Malvaceae).
Thyatirina achatina Weym.—Gossypiodes kirkii (Malvaceae).
Hoplotarache semialba Hamps.—Abutilon (Malvaceae).

Eutelianae

Eutelia mima Prout—Sideroxylon diospyroides (Sapotaceae).
„ *discistriga* Wlk.—Schinus molle, Spondias mombin (Anacardiaceae) : Canarium schweinfurthii (Burseraceae).
„ *subrubens* Mab.—Afzelia quanzensis (Caesalpiniaceae).
„ *melanga* B. Bak.—Ficus (Moraceae).
„ *adulatrix* Hbn.—Pistacia, Rhus cotinus, Schinus molle (Anacardiaceae).
„ *amatrix* Wlk.—Rhus vulgaris, Anacardium occidentale (Anacardiaceae).
„ *symphonica* Hamps.—Anacardium occidentale (Anacardiaceae).
Pacidara venustissima Wlk.—Anacardium occidentale (Anacardiaceae).
Phlegetonia catephioides Guen.—Ozoroa mucronata, Rhus erosa, R. vulgaris, Schinus molle (Anacardiaceae) : Capsicum (Solanaceae).

Sarrothripinae

Pardasene virgulana Mab.—Gossypium (Malvaceae) : Cajanus cajan, Flemingia grahamiana (Papilionaceae) : Dombeya bagshawei (Sterculiaceae).
Selepa docilis Btlr.—Harungana madagascariensis (Hypericaceae) : Solanum (Solanaceae).
„ *transvalica* Hamps.—Neoboutonia melleri (Euphorbiaceae) : Cissampelos (Menispermaceae).
Bryophilopsis tarachoides Mab.—Combretum (Combretaceae).
Risoba lunata Mschl.—Combretum (Combretaceae).

Acontianae

Earias biplaga Wlk.—Abutilon, Gossypium, Hibiscus cannabinus, H. esculentus, H. rosa-sinensis, H. sabdariffa, H. surratensis, H. vitifolius, Urena lobata (Malvaceae) : Sterculia setigera, Hermannia sp. (Sterculiaceae).

„ *citrina* Saalm.—Gossypium (Malvaceae) : Triumfetta (Tiliaceae).
„ *insulana* Bsd.—Abutilon, Althaea, Gossypium, Hibiscus cannabinus, H. micranthus, H. rosa-sinenesis, Abelmoschus esculentus (Malvaceae).
„ *cupreoviridis* Wlk.—Sida (Malvaceae).
Lophocrama phoenicochlora Hamps.—Grewia (Tiliaceae).
Maurillia phaea Hamps.—Combretum (Combretaceae).
Acripia chloropera Hamps.—Grewia similis (Tiliaceae).
Westermannia argyroplaga Hamps.—Sorghum (Gramineae).
Acontia graellseii Feisth.—Gossypium, Hibiscus, Lavatera alba, T. Azanza garckeana (Malvaceae).
„ *albago* F.—Wissandula amplissima (Malvaceae). Not in Seitz, nor in Hampson's Catalogue.
„ *malvae* Esp.—Abutilon, Hibiscus, Lavatera, Malva (Malvaceae).
Leocyma discophora Hamps.—Abutilon Malvaceae).
„ *camilla* Druce—Hibiscus diversifolius (Malvaceae).

Catocalinae

Audea fatilega Feld.—Acacia (Mimosaceae).
„ *endophaea* Hamps.—Hibiscus (Malvaceae).
Ulotrichopus primulina Hamps.—Acacia (Mimosaceae).
Egybolis vaillantina Stoll.—Deinbollia, Sapindus oblongifolius (Sapindaceae).
Cyligramma latona Cr.—Entada abyssinica (Mimosaceae).
Dermaleipa parallelipipeda Guen.—Vernonia (Compositae).
„ *nubilata* Holl.—Combretum, Quisqualis indica (Combretaceae).
Anua tirhaca Cr.—Ozoroa mucronata, Pistacia lentiscus, Rhus coriaria R. vulgaris, Schinus molle (Anacardiaceae) . Carissa edulis (Apocynaceae) : Maerua (Capparidaceae) : Cistus (Cistaceae) : Quisqualis indica (Combretaceae) : Pelargonium (Geraniaceae). Anacardium occidentale (Anacardiaceae).
„ *purpurascens* Strand—Eucalyptus camldulensis (Myrtaceae).
„ *mejanesi* Guen)
„ *tettensis* Hpffr.) Quisqualis indica (Combretceae).
„ *reducta* Mab.)
Tolna sypnoides Btlr.—Sapium ellipticum (Euphorbiaceae).
Achaea atrimacula Gaede—Pasture grasses (Gramineae).
„ *mercatoria* F.—Ricinus communis (Euphorbiaceae) : Sideroxylon diospyroides (Sapotaceae).
„ *catella* Guen.—Ipomoea batatas (Convolvulaceae) : Euphorbia crotonoides, E. hirta, E. scordifolia, Ricinus communis (Euphorbiaceae) : Pasture grasses (Gramineae)

: Eucalyptus camaldulensis (Myrtaceae) : Pinus radiata (Pinaceae).

„ *catocaloides* Hamps.—Cordia abyssinica (Boraginaceae) : Ipomoea batatas (Convolvulaceae) : Alchornea cordifolia, Ricinus (Euphorbiaceae) : Oryza sative, Pasture grasses (Gramineae) : Acacia (Mimosaceae) : Musa sapientum (Musaceae) : Leptospermum variegatum (Myrtaceae) : Phaseolus (Papilionaceae) : Rosa (Rosaceae) : Coffea (Rubiaceae).

„ *faber* Holl.—Sapium ellipticum (Euphorbiaceae) : Pelargonium (Geraniaceae) : Eucalyptus camaldulensis (Myrtaceae).

„ *echo* Wlk.—Psidium guajava (Myrtaceae).

„ *obvia* Hamps.)

„ *finita* Guen.) Ricinus communis (Euphorbiaceae).

„ *indeterminata* Wlk.—Calpurnea subdecandra (Papilionaceae).

„ *thermopera* Hamps. — Acacia mearnsii (Mimosaceae) : Leptospermum variegatum (Myrtaceae).

„ *mabilli* saalm.—Coffea (Rubiaceae).

„ *dasybasis* Hamps.—Loranthus (Loranthaceae).

„ *lienardi* Bsd.—Lantana camara (Verbenaceae).

Parallelia angularis Bsd.) Phyllanthus (Euphorbiaceae).

„ *palpalis* Wlk.)

„ *algira* L.—Phyllanthus, Ricinus (Euphorbiaceae) : Prunus, Rubus (Rosaceae).

Grammodes geometrica F.—Cistus (Cistaceae) : Zea mays (Gramineae) : Oxygonum atriplicifolium, Polygonum (Polygonaceae).

„ *stolida* F.—Quercus (Fagaceae) : Ziziphus jujuba (Rhamnaceae) : Rubus fruticosus (Rosaceae).

Chalciope hyppasia Cr.—Indigofera, Rhynchosia (Papilionaceae).

Mocis repanda F.—Grasses generally (Gramineae) : Pinus radiata (Pinaceae).

„ *frugalis* F.—Grasses generally (Gramineae).

„ *undata* F.—Desmodium, Pseudarthria, Vigna (Papilionaceae).

„ *mutuaria* Wlk.—Zornia glochidiata (Papilionaceae).

Pericyma mendax Wlk.—Acacia sieberana (Mimosaceae).

Phytometrinae

Syngrapha cirmumflexa L.—Brassica oleracea (Cruciferae) : Pisum sativum (Papilionaceae) : Solanum tuberosum (Solanaceae).

Plusiopalpa adrasta Feld.—Coleus (Labiatae).

Phytometra accentifera Lef.—Cineraria (Compositae) : Verbena (Verbenaceae).

„ *acuta* Wlk.—Canna (Cannaceae) : Ipomoea batatas (Con-

volvulaceae) : Crambe maritima (Cruciferae) : Geranium (Geraniaceae) : Zea mays (Gramineae) : Gossypium (Malvaceae) : Musa sapientum (Musaceae) : Arachis hypogaea (Papilionaceae) : Antirrhinum (Scrophulariaceae) : Lycopersicon esculentum, Nicotiana tabacum, Solanum (Solanaceae) : Commelina (Commelinaceae).

„ *limbirena* Guen.—Agave sisalana (Agavaceae) : Bidens pilosa, Cineraria, Lactuca sativa (Compositae) : Gossypium (Malvaceae) : Eucalyptus saligna (Myrtaceae) : Arachis hypogaea, Phaseolus (Papilionaceae) : Pinus radiata (Pinaceae) : Nicotiana tabacum (Solanaceae).

„ *orichalcea* F.—Coreopsis, Zinnia (Compositae) : Brassica (Cruciferae) : Ipomoea batatas (Convolvulaceae) : Cupressus lusitanica (Cupressaceae) : Pelarganium (Geraniaceae) : Linum usitatissimum (Linaceae) : Gossypium (Malvaceae) : Entandrophragma angolense (Meliaceae) : Dalbergia, Phaseolus, Pisum sativum (Papilionaceae) : Nicotiana tabacum (Solanaceae).

„ *phocea* Hamps.—Microglossa (Compositae).

„ *signata* F.—Brassica oleracea (Cruciferae) : Cyphomandra betacea, Nicotiana tabacum (Solanaceae).

„ *ni* Hbn.—Chenopodium (Chenopodiaceae) : Lactuca (Compositae) : Brassica (Cruciferae) : Antirrhinum (Scrophulariaceae) : Lycopersicum, Solanum (Solanaceae) : Urtica (Urticaceae).

„ *lunata* F.—Gynura (Compositae).

„ *transfixa* Wlk.—Artemisia africana (Compositae).

Abrostola triopis Hamps.—Commelina (Commelinaceae) : Pennisetum purpureum (Gramineae).

Ophiderinae

Polydesma umbricola Bsd.—Albizia (Mimosaceae).

Bareia oculigera Guen.—Ficus congensis, F. natalensis (Moraceae).

Bamra delicata Hamps.—Albizia (Mimosaceae).

Nagia gravipes Wlk.—Pinus patula (Pinaceae).

Melanephia tristis Snell.—Ipomoea batatas (Convolvulaceae).

Ericeia inangulata Guen.—Cassia fistula, C. Javanica (Caesalpiniaceae).

Sphingomorpha chlorea Cr.—Acacia, Burkea africana (Caesalpiniaceae) : Pisum sativum (Papilionaceae).

Calesia zambesita Wlk.—Thunbergia erecta (Acanthaceae).

Rhanidophora cinctigutta Wlk.—Thunbergia alata, T. erecta (Acanthaceae).

„ *albigutta* Fawc.—Thunbergia alata (Acanthaceae).

„ *odontophora* Hamps.) Thunbergia erecta (Acanthaceae).

„ *ridens* Hamps.)

Amblyprora acholi B. Bak.—Ficus brachypoda, F. natalensis, F. platyphylla, F. pumilio (Moraceae).
„ *magnifica* Schaus—Ficus eriobotryoides, F. natalensis (Moraceae).
Lacera alope Cr.—Caesalpinia (Caesalpiniaceae) : Cissampelos (Menispermaceae) : Canthium (Rubiaceae).
Hypocala deflorata F.) Diospyros (Ebenaceae).
„ *moorei* Btlr.)
„ *rostrata* F.—Diospyros abyssinica (Ebenaceae).
Calpe emarginata F.—Merremia quinquifolia (Convolvulaceae) : Sida (Malvaceae) : Cissampelos mucronata (Menispermaceae).
„ *triobliqua* Feld.) Cissampelos (Menispermaceae).
„ *provocans* Wlk.)
Plusiodonta wahlbergi Feld.) Cissampelos (Menispermaceae).
„ *natalensis* Wlk.)
„ *commoda* Wlk.—Merremia quinquifolia (Convolvulaceae : Ocinum suave (Labiatae) : Cissampelos (Menispermaceae).

N.B. In my experience, both *Calpe* and *Plusiodonta* feed solely on Menispermaceae.

Argadesa materna L.—Cocculus, Menispermum, Tinospora (Menispermaceae).
Ophideres fullonica L.—Cocculus, Menispermum, Tinospora (Menispermaceae).
Tathorynchus exsiccata Led.—Medicago sativa (Papilionaceae).
„ *homogyna* Hamps.—Indigofera (Papilionaceae).
Anomis sabulifera Guen.—Hibiscus (Malvaceae) : Corchorus, Grewia, Triumfetta (Tiliaceae).
„ *leucosema* Hamps.—Hibiscus (Malvaceae).
„ *leonina* Schaus—Hibiscus (Malvaceae); Grewia (Tiliaceae).
„ *simulatrix* Wlk.—Hibiscus (Malvaceae) : Cola (Sterculiaceae).
„ *flava* F.—Bombax malabaricum (Bombacaceae) : Sechium edule (Cucurbitaceae) : Althaea, Chorisia ventricosa, Gossypium, Hibiscus, Sida (Malvaceae). Sechium seems open to doubt.
Plecoptera punctilineata Hamps.—Millettia dura (Papilionaceae).
Maxera atripunctata Hamps.—Syzygium cordatum (Myrtaceae).
Maecllopsis ustata Hamps.—Mitragyna stipulosa (Rubiaceae).
Marcipa dimira Hamps.—Allophyllus africanus (Sapindaceae).
Marca proclinata Saalm.—Grasses generally (Gramineae).
Anticarsia irrorata F.—Phaseolus, Vigna unguiculata (Papilionaceae).
Gracilodes nysa Guen.—Rytigynia (Rubiaceae).
Ugiodes cinerea Hamps.—Typha (Typhaceae).

Schalidometra variegata Holl.—Ficus capensis, F. natalensis (Moraceae).
Pteronycta fasciata Hamps.—Thespesia garckeana (Malvaceae).
Serrodes inara Cr.—Pappea capensis (Sapindaceae).
Focidina semifimbria Wlk.) Uvaria sp. (Anonaceae).
Ugia amaponda Feld.)
Anomis endochlora Hamps.—Hibiscus (Malvaceae).
Marcipa pyramidalis Hamps.—Arzelia quanzensis (Caesalpiniaceae).
Attonda alboguttata Heyden—Acalpha sp. (Euphorbiaceae).

Focillinae

Mecodina apicia Hamps.—Ficus sycomorus (Moraceae).
Rhesala maestalis Hamps.—Coffea (Rubiaceae).
„ *imparata* Wlk.—Dalbergia (Papilionaceae).
Raparna imparata Wlk.—Samanea saman (Mimosaceae).

Deltoidinae

Simplicia inflexalis Guen.—Annona squamosa (Anonaceae) : Coffea (Rubiaceae).
Hypena jussalis Wlk.) Lantana (Verbanaceae).
„ *ignotalis* Wlk.)
„ *strigata* F.—Lantana trifolia (Verbenaceae).
„ *obsitalis* Hbn.—Barleria (Acanthaceae).
Bomolocha ectoglauca Hamps.—Pseudarthria (Papilionaceae).
Radara subcupralis Wlk.—Tragia brevipes (Euphorbiaceae).

Hyblaeinae

Hyblaea puera Cr.—Markhamia platycalyx (Bignoniaceae).
„ *euryzona* Prout—Markhamia zanzibarica, Fernandoa magnifica (Bignoniaceae).
„ *flavipicta* Hamps.—Duranta repens (Verbenaceae).

Le Pelley includes the following non-East African species in his list, presumably the result of mis-identifications.

Panthea acronyctoides Wlk. (Mominae)—Nicotiana tabacum (Solanaceae). This species is North American, as is its foodplant, although of course widely grown.
Laphygma frugiperda Smith (Amphipyrinae)—Eleusine coracan, Grain crops (Gramineae). This species is North and South American.
Phytometra chalcytes Esp. (Phytometrinae)—Morus (Moraceae) : Musa sapiantium (Musaceae) : Lycopersicon esculentum (Solanaceae) : Petroselinum crispum (Umbelliferae). This species is Oriental.

GEOMETRIDAE

Oenochrominae

Afrophyla vethi Snell.—Plumbago (Plumbaginaceae).
Petovia dichroaria H. Ssch.—Combretum (Combretaceae) : Phyllanthus discoideus (Euphorbiaceae) : Vangueria (Rubiaceae).

discoideus (Euphorbiaceae) : Vangueria (Rubiaceae).
Aletis helcita L.—Oxyanthus unilocularis (Rubiaceae) : Blighia unijugata (Sapindaceae).
Cartaletis libyssa Hpffr.—Oxyanthus, Randia (Rubiaceae).
Paraptychodes tenuis Btlr.—Ricinus (Euphorbiaceae) : Loranthus (Lorantnaceae) : Acridocarpus (Malphigiaceae).

Hemitheinae

Pingasa rhadamaria Guen.—Ziziphus Mauritiana (Rhamnaceae).
„ *ruginaria* Guen.—Psidium guajava (Myrtaceae).
„ *abyssinaria* Guen.—Maesa lanceolata (Myrsinaceae).
Paragathia albimarginata Warr.—Carissa edulis (Apocynaceae).
Comibaena leucospilata Wlk.—Ozoroa mucronata (Anacardiaceae) : Markhamia platycalyx (Bignoniaceae) : Hermannia
„ (Sterculiaceae).
Lophorrachia rubricorpus Warr.—Maerua hoehnelii (Capparidaceae).
Thalassodes digressa Wlk.—Ricinus communis (Euphorbiaceae).
Prasinocyma vermicularia Guen.) Ricinus communis (Euphorbi-
„ *simiaria* Guen.) aceae).
„ *tandi* B. Bak.)
„ *pupillata* Warr.—Citrus, Clausena (Rutaceae).
„ *nigrimacula* Prout—Vernonia (Compositae).
„ *neglecta* Prout—Ipomoea batatas (Convolvulaceae) : Ricinus communis (Euphorbiaceae).
„ *anadyomene* Townsend—Olea africana (Oleaceae).
„ *nereis* Townsend—Acacia (Mimosaceae).
„ *pictifimbria* Warr.—Ozoroa mucronata (Anacardiaceae) : Cajanus cajan, Eriosema (Papilionaceae).
Chlorissa albicristulata Warr.—Quisqualis (Combretaceae) : Zinnia (Compositae) : Turraea sp. (Meliaceae).
Rhodesia alboviridata Saalm.—Carissa edulis (Apocynaceae).
Omphacodes puchrifimbria Warr.—Acacia (Mimosaceae).
Lophostola annuligera Swinh.—Coffea robusta (Rubiaceae).
Eucrostes albicornaria Mab.—Euphorbia hirta (Euphorbiaceae).

Sterrhinae

Cancellalata subumbrata Fletcher—Phyllanthus niruri (Euphorbiaceae)
Chlorerythra rubriplaga Warr.—Acacia xanthophloea (Mimosaceae).
Traminda vividaria Wlk.—Dichrostachys cinerea (Mimosaceae).
„ *obversata* Wlk.—Albizia (Mimosaceae).
„ *acuta* Warr.—Acacia hockii (Mimosaceae).
Anisodes lycisearia Guen.—Uvaria (Anonaceae).
Somatina virginalis Prout—Jasminum (Oleaceae).
Problepsis digammata Kirby—Jasminum pubescens (Oleaceae).
Scopula ochroleucaria H. Sch.—Asystasia, Barleria (Acanthaceae) : Ipomoea (Convolvulaceae) : Plumbago (Plumbaginaceae) : Petunia (Solanaceae). Feeds on the flowers.

„ *lubricata* Warr.—Limonium sinuatum (Plumbaginaceae).
„ *bigeminata* Warr.—Silene macrosolen (Caryophyllaceae) : Lantana (Verbenaceae).
„ *nigrinotata* Warr.—Oxygonum sinuatum (Polygonaceae).
Rhodometra sacraria L.) Oxygonum sinuatum (Polygonaceae).
„ *sevastopuloi* Carc.)

Larentiinae

Disclisioprocta natalata Warr.—Bougainvillea (Nyctaginaceae).
Xanthorrhoe exorista Prout—Galinsoga parviflora (Compositae).
Nycterosea obstipata F.—Eucalyptus saligna (Myrtaceae).
Eupithecia psiadiata Tams—Psiadia arabica (Compositae).
Chloroclystis mokensis Prout—Phyllanthus (Euphorbiaceae).
„ *grisea* Warr.—Phyllanthus niruri (Euphorbiaceae).
Gymnoscelis tenera Warr.—Panicum, Sorghum (Gramineae).
Protostera spectabilis Warr.—Maerua (Capparidaceae).
Trimetopia aetheraria Guen.—Ampelopsis, Vitis (Ampelidaceae).
Chloroclystis consobrina Warr.—Hermannia sp. (Sterculiaceae).
Cambogia grataria Wlk.—Croton sylvaticus (Euphorbioceae).

Geometrinae

Omphalucha extorris Warr.—Maytenus heterophylla (Celastraceae) : Flacourtia (Flacourtiaceae).
Buzura abruptaria Wlk.—Cupressus lusitanica (Cupressaceae) : Albizia (Mimosaceae) : Maesopsis eminii (Rhamnaceae).
„ *edwardsi* Prout—Cupressus lusitanica (Cupressaceae) : Pinus patula (Pinaceae).
Colocleora simulatrix Warr.—Delonix regia (Caesalpiniaceae) : Ricinus communis (Euphorbiaceae) : Clematis hirsuta (Ranunculaceae).
„ *expansa* Warr.—Cupressus lusitanica (Cupressaceae).
„ *divisaria* Wlk.—Cupressus (Cupressaceae) : Eucalyptus (Myrtaceae) : Antigonum (Polygonaceae).
Hemerophila obtusata Warr.—Schinus molle (Anancardiaceae) : Tinnea aethiopica (Labiatae).
„ *simulatrix* Wlk.—Ipomoea batatas (Convolvulaceae) : Manihot esculenta (Euphorbiaceae) : Hoslundia (Labiatae) : Gossypium (Malvaceae) : Cajanus cajan (Papilionaceae) : Polygonum (Polygonaceae) : Coffea (Rubiaceae).
Xylopteryx arcuata Wlk.—Maerua (Capparidaceae) : Maytenus (Celastraceae).
„ *interposita* Warr.—Maytenus heterophylla (Celastraceae).

(To be continued). D. G. Sevastopulo.

THE AES CROSSWORD

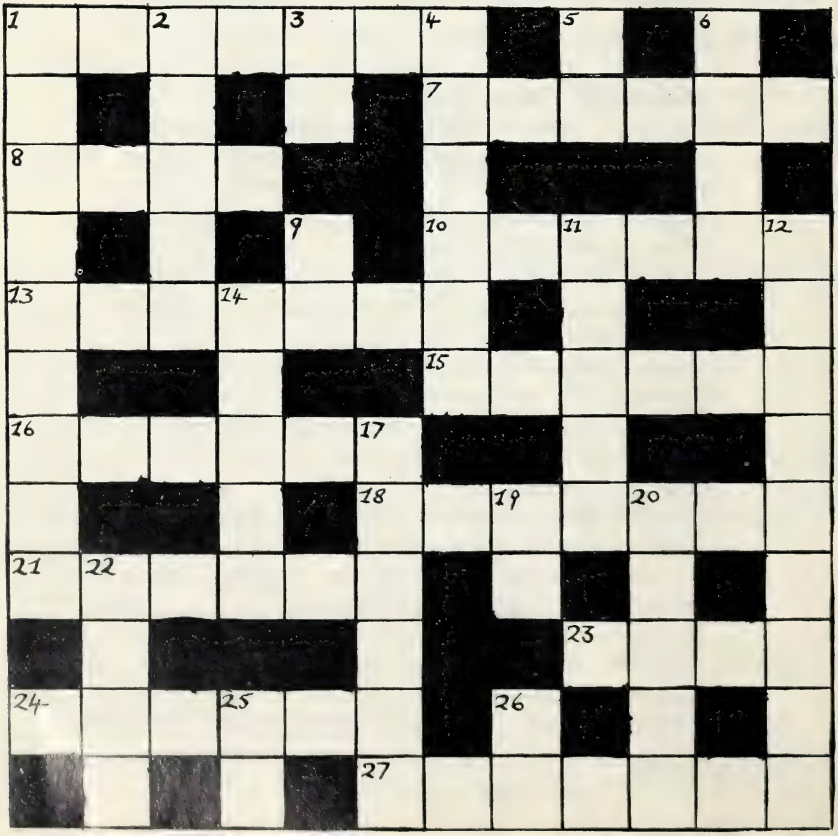
Compiled by D. J. Moon

CLUES ACROSS

1. Social insect (7)
7. Skeletal substance (6)
8. Observant Hawkmoth? (4)
10. Extinct fenland moth (6)
13. Bee parasite (7)
15. Cast skin (6)
16. Antenna (6)
18. Interests of the EEG (7)
21. *Tegeticula* pollinates these (6)
23. Antennal branches (4)
24. Laid down by 'calling' female (1, 5)
27. Whence *luna* & *selene* are derived (3, 4)

CLUES DOWN

1. Sleepy African insect? (6, 3)
2. Haunts of waterside wainscots (5)
3. Bull's-eye! (2)
4. Hatch (6)
5. Short-named Plusia (2)
6. Elder mounting material (4)
9. Stink bug suffers thus! (1, 1 abbr.)
11. Alternative for 20 DOWN (5)
12. Pheromone is one (9)
14. Poorer food for *S. cynthia* (5)
17. Patience brings the perfect rearing one (6)
19. Eggy prefix (2)
20. Final instar (5)
22. Terpsichorean silkmoth genus (4)
25. Amateur Entomologist (abbr.)
26. Exotic Entomologist (abbr.)



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